SCIENTIFIC AMERICAN

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TESTING THE PARTS OF A MODERN BICYCLE.

The American bicyclist has become a most exacting judge of the qualities of a wheel. He insists on perfect finish, silent running, and lightness, and at the same time, on good roads and bad, gives the wheel the most severe trials imaginable. In England and on the Continent riders are perfectly satisfied with wheels weighing from 30 to 50 lb.; here bicycles must weigh from 18 to 26 lb. The consequence is that American wheels must be of the highest standard, or they will be accounted low grade by the rider.

To meet this condition of things, the Pope Manufacturing Company, the makers of the world-famous "Columbia," have established a system absolutely unique in the bicycle world; namely, a testing department, where every article which enters into the construction of a bicycle can be tested with the highest degree of accuracy. Samples of the tubing are subjected to direct and vibratory strains to see if it possesses the desired mechanical qualities, and analysis of the same sample shows how far those qualities are determined by, and can be predicated upon, chemical composition. Steel balls are broken to test what they will stand; cranks, sprockets and chains are experimented with to ascertain the best shape and material for each. Spoke wire is fractured and its data are fixed.

The greatest difficulty encountered in bicycle building is in maintaining the model originally designed in unvarying exactness of strength and material through hundreds and thousands of machines. It requires the highest engineering skill and the widest mechanical knowledge to design a bicycle that will run with smooth accuracy under all sorts of varying conditions, but, when this is done, what assurance has the buyer that the machine he receives is an exact duplicate of the original so carefully designed? Only the most rigid testing of materials and sample parts through all the processes of manufacture can prevent the substitution of inferior material or variations from prescribed pattern. Of course no such test will be satisfactory which does not destroy the piece tested, and so samples picked at random are used for the purpose.

With the heavy wheels of a few years ago, such painstaking tests as are now deemed essential to determine the exact material and construction of every part were not required, but with the modern wheel the pleasure of the rider, and his safety, depend upon it.

The accompanying illustrations clearly show the de-

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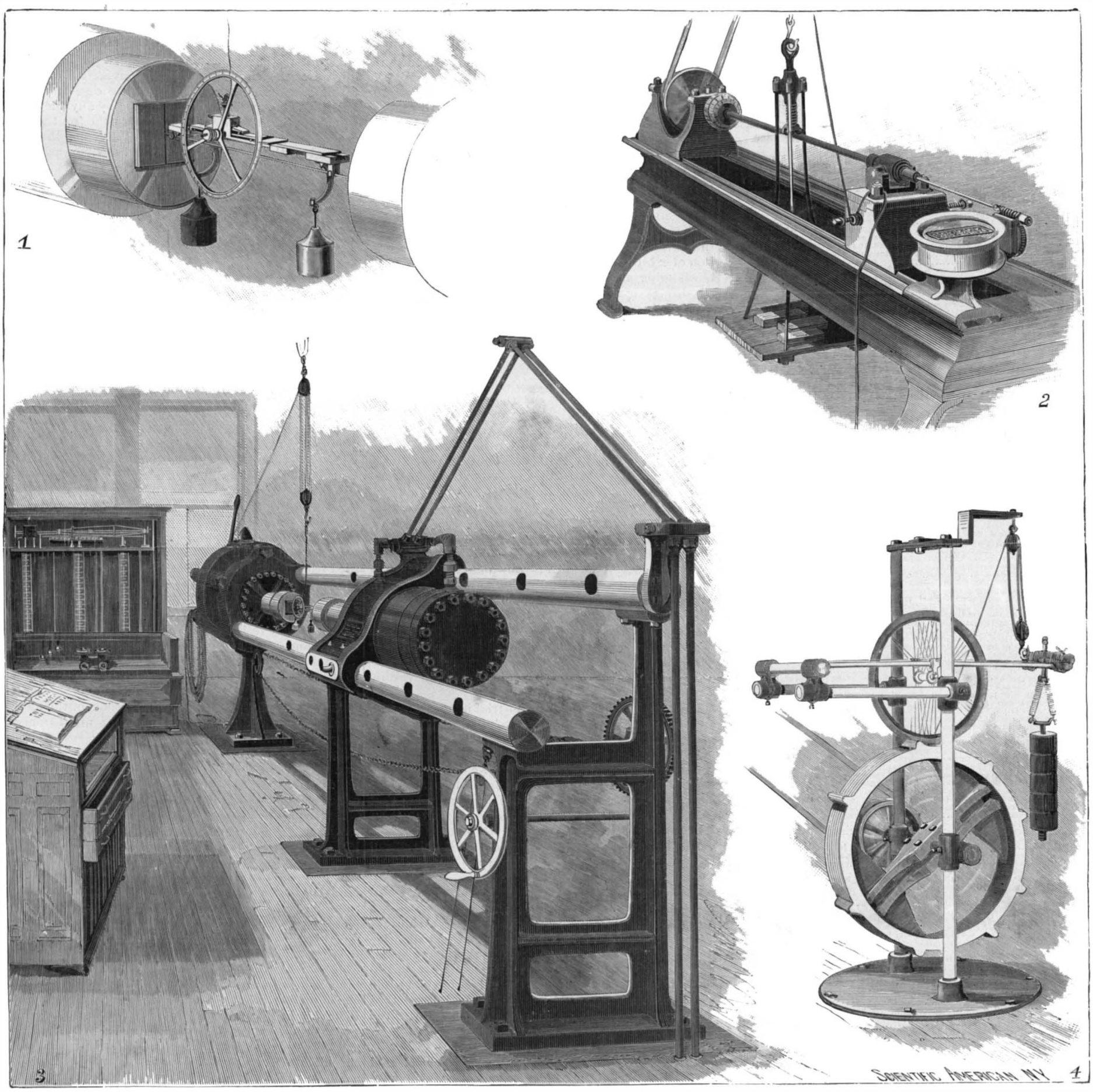

TESTING THE PARTS OF A MODERN BICYCLE.

Scientific American.

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1071.

For the Week Ending July 11, 1896.

Price 10 cents. For sale by all newsdealers.

THE PRIZE ESSAY COMPETITION.

Our readers will be pleased to know that, judging from the number of essays submitted for examination, the competition has been a great success. The papers are all in the hands of the committee, and we hope to be able to announce the name of the winner of the $250 prize in our next issue.

We would call the attention of our readers to the card published in another column concerning what invention introduced within the last fifty years has conferred the greatest benefit upon mankind. We hope that all our readers will fill out the ballot and send it to the editor, as the polls will close on July 13th, and it is desired to procure as large a vote as possible. Some who have not carefully read the announcement have cast their votes for such inventions as the printing press, the steam engine, etc. Of course, such ballots will have to be thrown out, as being too indefinite, or as not coming within the terms of the competition. The final result will be published in our special issue of July 25.

THE PARIS EXPOSITION OF 1900.

Exhibitions have come thick and fast in the closing years of the nineteenth century. The more frequent industrial displays of States, cities, and provinces have been the background which has served to show up the stately splendor of the less frequent international fetes—they are nothing less—such as that at Paris in 1889, and again at Chicago in 1893. At the close of our late exposition, which was universally admitted to have been more extensive, complete, and artistic than any that preceded it, it was predicted that the limit had been reached, and that nothing on a like scale would be again attempted.

Yet, as a matter of fact, before the blackened remains of the Chicago Fair are well cleared away, it is announced that the arrangements are complete for what is to be the most elaborate and brilliant industrial display of the century. If any people but the French had made the promise, those of us who had the privilege of seeing the proportions and beauty of the architectural display at Jackson Park would be prepared to doubt its fulfillment. There were not wanting visitors to our exposition who complained of its size, and suggested that a smaller display of selected exhibits would be more effective and intelligible. If the Parisians are aiming to gather a yet larger collection of exhibits, there is a danger that it will become bewildering and oppressive in its proportions. That the display of architectural and landscape skill in the buildings and grounds will be of a very high order goes without saying in a city so rich in artistic talent as Paris; and yet we very much doubt if any grouping of buildings in the Renaissance and later French styles, however skillfully carried out, can be made to equal the chaste beauty and dignified repose of the noble group which composed the Court of Honor at Jackson Park.

It is to be hoped that our Congress will deal liberally with the question of a subsidy to cover the expenses incidental to a worthy national representation at the Paris Exposition. With one exception, the great manufacturing nations made a noble response to our invitation to Chicago, and the present indications are that there will be a keen rivalry between England, Germany, Russia and France, which will lead to a magnificent industrial display on the part of each one of these nations. What is to be the relative standing of the United States? If we do anything at all it should be well done. Rather than make an imperfect display of our natural and industrial resources, it would be better to stay away altogether. We do not fear such a result; but we do think that it would be greatly to our national advantage to put up a really magnificent display which shall be fully representative of our vast resources and industries.

The time has come in our industrial history when we are beginning to turn our eyes abroad and push out more actively into foreign markets.

Many distinctively American products, whose market is at present exclusively American, would be found to be equally adapted to European needs, if a trial were once made. It is only within the last few years that the typewriter has been systematically introduced—and there are a thousand and one labor-saving devices, that are considered indispensable on this side of the water, which are as yet unknown in Europe. This is true not merely of the lighter trades, but even in the weightier matters of transportation. The European still navigates his rivers and lakes in uncomfortable and shelterless steamers; and the sight of a model of a Sound or Hudson River steamboat, with its spacious saloons and comfortable staterooms, would be a positive object lesson in matters of accommodation and comfort. Moreover, there is scarcely a trade which has any degree of connection in Europe that could not spend a large sum on its exhibits with the certainty of a profitable return.

THE secretary of Smithsonian Institution has leased one of the tables at the Naples zoological station for another three years for the benefit of American students.

A Singular Mode of Incubation.

It is well known that the Australian megapod is a bird that is accustomed not to sit on its own eggs. In certain parts of Australia are found numerous mounds of considerable size and height, which the first explorers took to be burial mounds. These were made by the Megapodius tumulus, which uses them for hatching its eggs. They have sometimes considerable dimensions: a nest that is 14 ft. high and 55 ft. in circumference may be regarded as large. Each megapod builds its own nest with materials which it gathers from all sides, and these are exactly what the gardener uses in the month of March to make his forcing beds, namely, leaves and decomposing vegetable matter, which, by their fermentation, give off an appreciable amount of heat. In the forcing beds, this heat hastens the sprouting of the seeds; in the nest it suffices for the development and hatching of the young birds, and the mother can go where she likes and occupy herself as she wishes, without being troubled by the duties of sitting. In the small island of Ninafou, in the Pacific, another bird has a somwhat similar habit, in so far as it also abandons its eggs; but in place of obtaining the necessary heat from fermentation, it gets it from warm sand. The leipoa, or native pheasant of Australia, acts like the megapod, and watches the temperature of its mound very closely, covering and uncovering the eggs several times a day to cool them or heat them, as becomes necessary. After hatching, the young bird remains in the mound several hours; it leaves on the second day, but returns for the night, and not until the third day is it able to quit the paternal abode.—Revue Scientifique.

Experiment with Rotary Motion.

An interesting experiment described in Invention illustrates the stability given to a moving body by rotating or spinning it rapidly, as in the case of a rifle bullet. The experiment can be made by any bicyclist when cleaning his wheel. "Assuming the front wheel is detached, lay it upon the floor and, keeping the axle vertical by the hand, give the wheel a vigorous spin. The axle remains unaffected, the wheel running in the ball races. Now lift the wheel by means of the axle and put the left hand under the wheel and catch the other end of the axle. You now have a horizontally revolving wheel, and you will be astonished to find how difficult it is to turn the wheel into a vertical position as long as the spinning continues. Let this cease and you can do as you like with the wheel, but give it a vigorous spin and you will find, whatever position it was then in, it will show the perversity of a pig if you attempt to change it. In making this experiment, get a good grip, as it throws a very considerable strain on the arms and feels, indeed, as though one were struggling with some aerial wrestler. Imagine now a shot starting on its course with this rotary motion; if it meets an obstruction fairly and squarely, the forward motion will be somewhat arrested, but the boring action due to rotation will give it a terrible penetrating power. Again, suppose it strikes at a slight angle, and you may think it will glance off like a stone from a smooth piece of walling. The new force, however, here comes into play, and most decidedly objects to the alteration of direction, thereby causing penetration that would be quite impossible under other circumstances. After making the above experiment, you will find you have a much increased respect for a shot fired from a rifled barrel."

How Colds are Taken.

A person in good health, with fair play, says the Lancet, easily resists cold. But when the health flags a little, and liberties are taken with the stomach or the nervous system, a chill is easily taken, and according to the weak spot of the individual, assumes the form of a cold or pneumonia, or it may be jaundice. Of all causes of "cold," probably fatigue is one of the most efficient. A jaded man coming home at night from a long day's work, a growing youth losing two hours' sleep over evening parties two or three times a week, or a young lady heavily "doing the season," young children overfed and with short allowance of sleep, are common instances of the victims of "cold.

Luxury is favorable to chill taking; very hot rooms, feather beds and soft chairs create a sensitiveness that leads to catarrh. It is not, after all, the "cold" that is so much to be feared as the antecedent conditions that give the attack a chance of doing harm. Some of the worst "colds" happen to those who do not leave their houses or even their beds, and those who are most invulnerable are often those who are most exposed to changes of temperature, and who by good sleep, cold bathing, and regular habits preserve the tone of their nervous system and circulation. Probably many chills are contracted at night or at the fag end of the day, when tired people get the equilibrium of their circulation disturbed by either overheated sitting rooms or underheated bedrooms and beds. This is specially the case with elderly people. In such cases the mischief is not always done instantaneously, or in a single night. It often takes place insidiously, extending over days or even weeks.

Recent Patent and Trade Mark Decisions.

Hostetter Company v. Becker (U. S. C. C. N. Y., Coxe, J.), 73 Fed. Rep., 297.

Unfair Competition.—The complainant in this suit had for many years sold "Hostetter's Bitters." The defendant made an article resembling it in color and other particulars and sold it under the name of "Host-Style Bitters" in large unlabeled demijohns, and in several instances had given the purchasers empty bottles bearing complainant's labels. The court held that, although the purchaser from the defendant was not deceived by this transaction, yet he had furnished the means for deceiving the public and should be enjoined from selling "Host-Style Bitters" and in connection with the sale giving to the purchaser empty "Hostetter" bottles.

Welker v. Weller (U. S. C. C. Penn., Buffington, J.) 73 Fed. Rep., 299.

Fastenings for Table Legs.—The Welker patent, No. 480,526, for a fastening for legs of knockdown tables, in view of the prior art, is not infringed by constructions which do not embody the longitudinal segmental kerfs and the tenons secured in the kerfs or grooves, and in which an old well known joint is used.

Design for Table Leg.—The Welker design patent, No. 22,997, has been held void for want of novelty.

Troy Laundry Machinery Company v. Adams Laundry Machine Company (U. S. C. C. A., 2d Cir.), 73 Fed. Rep., 301.

Laundry Dampening Machine.—The Wendell and Wilds patent, No. 401,770, was so limited by the action of the Patent Office and the acquiescence of the patentees therein, and by the specific language of the claims and specifications, that a thin textile covering of the dampening rollers is a material element of the claim, so that the claims are not infringed by constructions having a thick covering of felt for the rollers.

Croskey v. Atterbury (Pat. Comm.), 75 O. G., 1359.

Diligence in Reduction to Practice.—Croskey conceived his invention in the manufacture of hollow glassware in December, 1890, and reduced it to practice in October, 1892, while Atterbury conceived it in July, 1892, and filed an application in October, 1892. Atterbury was held to be the prior inventor in the absence of a showing of reasonable diligence by Croskey.

Reduction to Practice.—To reduce a method or process to practice, the series of acts which constitute such action or process must be performed.

Diligence in Reduction to Practice.—Where an inventor could have completed his process at any time within two years but failed to do so, he cannot establish a case of reasonable diligence against one who conceived the invention later but filed an application before the first inventor reduced his invention to practice.

Dewey v. Colby (Pat. Comm. Dec.), 75 O. G., 1360.

Subsequent Claim.—An illustration that amounts to not more than a suggestion does not warrant a claim filed nearly two years after the application and nine days after an interfering patent.

Reduction to Practice.—The drawing of a device is not reduction to practice.

National Conduit Manufacturing Company v. Connecticut Pipe Manufacturing Company (U. S. C. C. Conn., Townsend, J.), 75 O. G., 1361.

Effect of Estoppel on Validity of Patent.—A party selling a patent is estopped from denying its validity because he has received and retained a valuable consideration based upon an implied representation that the patent is valid, and the sale of the patent amounts to an agreement by th seller that whether the patent be found to be void or valid, he will not interfere with the rights of any subsequent holder of the patent.

Sale of a Void Claim.—When an application for a patent has been sold, and afterward it is found that a claim therein is void, but the purchasers complete the payment of the consideration after gaining such information, their acts amount to an election to stand by the contract instead of repudiating it.

Acts of a Contracting Stockholder.—A corporation is considered in law to have a distinct personality independent of its stockholders, and therefore is not responsible for the personal acts of its stockholders, but this doctrine does not hold where the seller of a patent has nearly all the stock of a corporation, and either uses such corporation as a mere cover for such transaction of his business or there is knowledge of his transactions on the part of the other stockholders, and hence the corporation will be bound by the acts of such stockholders.

Excelsior Guard and Hatch Cover Company v. Foote (U. S. C. C. N. Y., Townsend, J.), 75 O. G., 1364.

Means for Closing and Controlling Hoistway Covers.—Letters patent No. 278,528, granted May 29, 1882. to Daniel Frazier, have been held void because the improvement therein set forth did not involve the exercise of the inventive faculty over the prior art.

Adaptation is not Always Invention.—The adaptation from a different art of devices which successfully accomplish in a given apparatus results previously imperfectly accomplished by crude apparatus does not amount to invention.

Gould Coupler Company v. Pratt (U. S. C. C. N. Y., Coxe, J.), 75 O. G., 1547.

Car Couplers.—Patent No. 254,106, of Feb. 28, 1882, to Clinton Browning for car couplers of the Janney type has been held valid.

Patentability of a Simple Invention.—An invention does not cease to be meritorious because it is simple. The test is not whether the mechanism is simple or complicated, but whether the patentee has given the world something new, whether the public is richer for the contribution to the art, and whether he has produced new and useful results. Hence, invention should be determined more by the ascertainment of what the inventor has actually accomplished than by the technical analysis of the means by which the result is attained.

Infringement While Omitting Subordinate Feature.—Where the real value of an invention lies in one element of the invention and an infringer has appropriated that, he should not be allowed to escape on the plea that he had omitted a subordinate and apparently insignificant feature, unless it is apparent that he has omitted it. To find an invention meritorious and then defeat it by an illiberal construction is consistent and unfair. To decide that the inventor has conferred a benefit upon mankind and destroy his patent by a harsh construction is condemned both by the general principles of equity and by express authority, for the court should be diligent to give him a reward for his genius and resolve all questions in favor of the invention.

Car Couplers.—Claim 3 of the Barnes patent, No. 337,650, May 9, 1886, must be limited to the specific details shown and described.

The July Heavens.

The sun has now turned his face to the southward, and the days are forced once again to yield some of their time to the nights. On the 1st of the month the sun will rise at 4:32 and set at 7.35, making the day fifteen hours and three minutes long, whereas on the last day of the month almost three-quarters of an hour's difference will be found in the day's loss and the night's gain. The sun has two of the planets in conjunction with it this month, Venus and Mercury, the former on the 9th and the latter on the 31st. In both cases the planets pass on the further side of the sun from that on which our planet is to be found at the time.

The last quartering of the June moon will occur on July 2, and on the 10th the new moon for July is due. There is first quarter on the 17th and full moon on the 24th, when the moon, being well south in declination, will seem so very much nearer than when it rises further north and passes so high over our heads when it reaches our meridian. There are some very close meetings this month between the moon and several of the planets. The meetings between the remaining planets and Luna are at too great a distance to play an important part in the monthly events of interest.

On the 9th Venus is in superior conjunction with the sun, and passes once more to the realm of the evening stars. It will be some little time before we can see her face, but it will be very well worth seeing when we are permitted to have a look at it, and what still more concerns us is the fact that we shall have her with us throughout the year. The new moon and Venus are in conjunction on the 10th, which shows that both are fairly close to the source of light and heat.

Mercury, on his way to the eastward, passes the sun on the last day of the month, and again joins the ranks of the evening stars, where he will remain until October, when he is in inferiorconjunction and rejoins the morning brilliants, to which he makes a very slight addition, as his face during this portion of his tour is hardly visible.

Mars and the fading crescent are in line on the 4th. At the time of this conjunction the planet is close to the constellation of the Fishes. Mars is moving toward the position of quadrature with the sun, a point that he will not reach until the close of August, and it will be almost the middle of December before he is in opposition with the sun. Between now and then his disk will have increased two and a half times its present size, and his cheerful, ruddy face will be a most welcome addition to our evening studies. Neptune still is numbered with the morning stars, and obstinately refuses to let us see him in all his glory. Even when in line with the moon on the 8th, the two are so far separated that we can form but a very vague idea of the planet's locality from that in which we see our satellite.

Uranus is moving toward quadrature, where he will arrive in August. He is an evening star at present, and is in the constellation of the Scorpion.

Jupiter for awhile ceases to have as lively an interest for us as he has been having for some months, as he has drawn in toward the sun so close that his face has become quite dim. When he reappears it will be as a morning star, there to be classed throughout the remainder of the year.

Saturn is an evening star, and next month will have completed one-quarter of his journey, and will be in quadrature with the sun. Three months later he will be in conjunction, and after that will belong for the remainder of the year to the morning stars. The planet is now to be found in the group of the Virgin.

Just now we must look toward the south to find the most glorious display of stars in the evening. The contrast between the northern and southern skies is very strange. Toward the north the region below the pole shows not a single star above the fourth magnitude, while in the opposite direction it is singularly rich in large stars, chief among them being Antares, perhaps the most beautiful of all the red stars. The large constellation Ophiuchus has been supposed by some to represent Æsculapius and by others to be another celestial Hercules. In the constellation Corona Borealis there was a star suddenly blazed out some thirty years ago, and, though it soon failed in luster, it can be found with the telescope. When at its brightest it appeared as a second magnitude star. In the eastern section of the heavens the Milky Way has now risen high above the horizon, and in clear weather can be studied very advantageously. With a good peraglass the bright parts of the galaxy here will be found to be ablaze with stars. The little group known as Delphin is now conveniently located for observation, with the Lesser Horse below it and Pegasus from the left. The constellation Cygnus is now well placed or observation, and the cross that one can fairly picture here is fully as fine as the famous Southern Cross. In the west Regulus is the most brilliant star; then there are the constellations Hydra, Leo, and overhead Ursa Major.—New York Times.

Spiders that Catch Birds.

Mr. W. J. Rainbow, an Australian naturalist, gives the following description of the large bird-entrapping spiders of his country, which we quote from the American Naturalist: Representatives of this genus abound in tropical and subtropical regions. Their webs are composed of two kinds of silk—one yellow, exceedingly viscid and elastic, the other white, dry, and somewhat brittle. The latter is used for the framework of the web, the guys, and radii, and the former for the concentric rings. These snares are at varying heights, sometimes within reach, again ten to twelve feet from the ground, but always in a position exposed to the rays of the sun. The diameter is also variable, from three feet upward. One seen by Graffe in the Fiji Islands constructs a web thirty feet in diameter. These snares are strong enough to entrap small birds.

In the author's opinion the web is not set for such game, and the spider does not feed on her ornithological victim. In the cases where she has been observed with her fangs in the body of the ensnared bird it is probable that it is for the purpose of hastening the death of the bird in order to prevent its injuring the web in its struggles to escape. Spiders of the genus Nephila are easily tamed. Although exceedingly voracious, they can nevertheless exist for many days without either food or water. They pair in autumn. The sexes inhabit the same web for a considerable time, the female in the center and the male on the upper edge of the web. His efforts to ingratiate himself in the favor of his mate are not always successful. It not infrequently happens that he has to retire from her presence minus two or three legs.

Population of Paris in 1896.

The administration, says the Revue Scientifique, has just made known the first results of the census of Paris taken on the 29th of March. These results show a population of 2,511,955 inhabitants for the entire capital. If this figure be compared with that obtained five years ago (say 2,424,703 inhabitants), we find that the increase has been 87,250.

It is found that the entire center of Paris, say 31 quarters out of 80, nearly half of the most populous quarters, is visibly becoming depopulated to the profit of the suburbs and periphery of the capital. In fact, the total of the diminutions reaches the figure of 19,000 units, which represents practically the loss in the main departments of the city proper, while the total increase of the 49 quarters whose population has augmented exceeds 106,000 individuals, that is to say, exceeds the population of cities such as Rouen, Havre, Reims and Roubaix.

Hereafter, it will be no longer in the most populous quarters that it will be well to look for the seat of the normal increase of the population of Paris. The center is saturated, and it is toward the outskirts—toward the suburban and freer quarters, and especially beyond the fortifications—that Parisians are tending more and more to emigrate.

ROENTGEN rays have been used to take pictures of flowers. They show the ovules inside the ovary in an unopened bud, the seeds within a seed vessel, and even the veins upon the white petals of a flower.

A New Secular Version of the Bible.

A new English version of the Old Testament, from a text corrected by comparison of the best manuscripts, has for some years been in preparation by the Johns Hopkins Press, says the Baltimore Sun, under the supervision of Prof. Paul Haupt, of the Johns Hopkins University, and by the end of the present year a number of the books composing the Hebrew Scriptures will have been published. A feature of the enterprise is that it is not in the hands of theologians. It is purely a secular work, and the only aim has been to get, first, a correct text, and then a correct translation, without regard for its bearing upon any creed or scheme of unbelief. Since the time of King James, when the received version was made, many new helps to the right rendering of the Hebrew text have been discovered. Semitic scholarship has made great advances in methods as well as the acquisition of ampler materials for comparison, elucidation and study. By the coöperation of Semitic scholars of the whole learned world, Prof. Haupt has secured a Hebrew text which is being printed at Leipzig. It is printed in colors, the same page having sometimes as many as four colors, each color denoting a different element in the construction of the text. A single line may contain several colors to distinguish the undoubted original from portions that are in doubt. The fact that parts of the same book belong to different periods or authors will also be indicated. For example, in the book of Leviticus the "Priestly Code" will be in black letters on a white background. The parts added later will have a brown background and the Law of Holiness will be in yellow. Interpolations are indicated by overlining. Where the original is poetry this will be indicated in the translation.

After securing a perfected text the various books were allotted to the most learned Orientalists of this and other countries for translation, the book of Ecclesiastes being allotted to Prof. Haupt. In a recent issue of the New York Journal an article by Rudolph Block compares the new version of chapter xii of Ecclesiastes with the old with some interesting results. The chapter is chiefly an exhortation to the cheerful enjoyment of the good things of life, with an allegorical conclusion in which the decay of the several faculties is ingeniously depicted. Everyone recalls the familiar passage, "Remember now thy Creator in the days of thy youth, while the evil days come not," etc., and the following passage: "In the days when the keepers of the house shall tremble and the strong men shall bow themselves and the grinders cease because they are few and those that look out of the window be darkened." In the new version this runs:

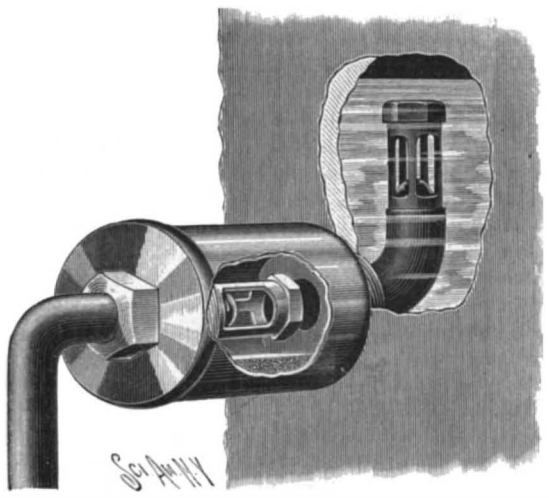
> Remember thy wife in the days of thy vigor,
> Ere there come the days of evil,
> And the years draw nigh
> In which thou wilt say I have no pleasure.
> Ere is darkened the sun and the light of day,
> And the moon, and the stars,
> And the clouds return after the rain,
> When the keepers of the house tremble,
> And the men of power bend themselves;
> The grinding maids cease
> And the ladies that look out through the lattice are darkened.

The meaning is plainer in the new version. "Ere is darkened the sun," the professor says, refers to the sunshine of childhood, when all is bright. The "moon" suggests the tempered light of boyhood, while the "stars" indicate fewer moments of happiness in mature age. As age advances there are many days darkened with rain "and the clouds return after the rain," so that there are few bright moments. The "keepers of the house" are the hands. As age proceeds erectness of carriage is lost—"the men of power bend themselves." Man loses his teeth, which are "the grinding maids," and his eyes grow dim—"the ladies that look out through the lattice are darkened." The old man's sleep is short and "he rises at the voice of the birds." The "daughters of music are brought low" means that the sense of hearing is lost. The septuagenarian dislikes to go upstairs or climb a hill—he is "afraid of that which is high." His hair becomes white—"the almond tree blossometh." The pessimism of the chapter is intensified in the concluding line of the new version, "All is vanity and all that is coming is vanity."

THE College of Civil Engineering at Cornell University is engaged in the determination of the longitude of Cornell. They are working conjointly with the United States Naval Survey and Harvard University. Two officers of the naval survey are stationed at Washington, D. C., for accomplishing this purpose. The astronomical observations at the three places must be carried on simultaneously, and great difficulty is experienced in getting nights which are sufficiently clear at all three places. Twenty stars are to be observed, in sets of four each night, and ten nights of simultaneous observation will be required to complete the work. The Cornell observer will then go to Washington to correct his personal equation, after which all the three sets of observations will be reduced to a common standard of time, and the special relation of Cornell to the rest of the universe will be determined with final accuracy.

SAFETY CHECK FOR BOILERS.

The safety check shown in the illustration has been patented by Mr. Frank Albin, of Dodge City, Kansas, and is especially intended for use on locomotive boilers. It consists of an exterior mud pocket, which is threaded into the shell of the boiler, and receives at its outer end the injector pipe. The mud pocket is closed by a threaded cap which is perforated, and on the inner side is extended to form a valve cage in which is located a ball valve. The passage from the mud pocket to the boiler terminates in a short elbow which is screwed into the neck of the pocket and extends upward within the boiler, where it terminates in a ball valve similar to that in the pocket. The feed water, in passing through to the boiler, will deposit any solids and foreign matter which it may contain, within the mud pocket, where it will collect and settle. It

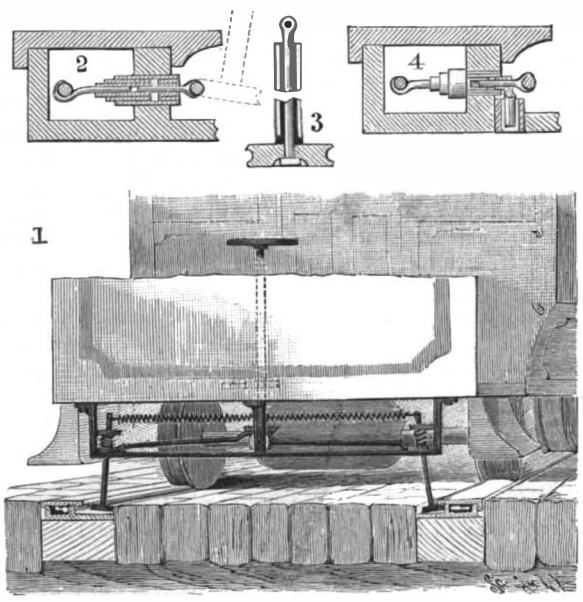


ALBIN'S SAFETY CHECK FOR BOILERS.

will be seen that the ball valves will prevent the return of water from the boiler, and should the mud pocket be broken off, the valve on the inside of the boiler will effectually prevent the terrible effects which ordinarily follow from the escaping water and steam in the event of collision. The inner ends of both the valve chambers are closed by spanner nuts, and the various connections are threaded, so that the device is easily taken apart for inspection. The valve in the interior of the boiler, moreover, enables the mud pocket to be opened and cleaned at any time when the boiler is under steam.

THE DUCT TROLLEY RAIL.

The device shown in the accompanying illustration is intended to dispense with overhead conducting wires, or the underground duct, as commonly used on electric railroads; and its construction is such that leakage of electricity is prevented, and the danger of accident to persons or horses in crossing the tracks is entirely removed. It has been patented by Mr. Charles Sill, of 301 West 12th St., New York. Each rail contains a continuous longitudinal duct, in which is carried the



THE DUCT TROLLEY RAIL.

conductor, and on the inner side of the rail is formed a recess, in which is carried a sectional trolley wire which is engaged by a trolley wheel, whose rod is adjustably mounted in a bracket attached to the under side of the car. The upper ends of the trolley rod are drawn together by the tension of a coil spring, and they terminate in wires which lead to the motor, the action of said spring serving to keep the trolley wheels in contact with the trolley wire. The conductor and the trolley wire are normally disconnected, and they are automatically connected as the car passes along the track. This is done by means of a contact making and breaking device, which is adjusted in the inner web of the rail and consists of two rods, one of which carries the conductor and the other the trolley wire, said rods being normally held apart by the tension of a rubber spring. These rods are carefully insulated from the rail, which carries them, so that only upon their being brought into contact with one another by the pressure of the trolley wheel as it passes can any circuit be formed between the conductor and the trolley wire. The transversely extending rod which carries the trolley wire is slidably supported at the upper end of a vertical rod, which is carried by the base of the rail, and carefully insulated therefrom. The whole of the insulation is carried out with great care, and the construction is such that all moisture is excluded from the conductor and leakage prevented. The trolley rod is hung pivotally on the upper arm of the above mentioned bracket, and has a rocking motion transversely to the car, in a slot in the lower arm of said bracket. The trolley rod is joined by a connecting rod to a crank disk, secured on a shaft extending longitudinally to the car, which is connected at each end by bevel gear wheels with the controller shaft on each platform.

By turning the controller in one direction, the crank disks operate to press the trolley rod wheels against the trolley wire, and thus push its carrying rods into electrical contact with the carrying rods of the conductor within the rail duct, thereby forming a temporary circuit on that particular section of the track, during the passage of the car. A coil spring, engaging the trolley rod and the two carrying brackets, allows sufficient vertical adjustment to meet the irregularity of the track or the passage of the car wheels over an obstruction.

The Heat Conducting Power of Metals.

After a thorough investigation of this subject, Herr W. Beglinger has arrived at the following conclusions: The results show that the heat conducting power of the different kinds of iron is altogether different. It is, therefore, of the greatest importance to know the coefficient of the inner heat conducting power. Steel and wrought iron show a more uniform behavior in this matter than cast iron. It is not confirmed that hardening reduces the conducting power of steel by almost one-half, though it may be conceded that hardening will reduce it slightly. The difference in working, by forging or rolling, showed only in one case, with wrought iron, considerable differences for the conducting power. Casting seems to cause far more irregularities.

Wrought iron showed generally better conducting power than did steel. Herren L. Holborn and W. Wien have compiled a table showing the heat conducting power of the different values. The average value for the different kinds of iron and steel is given. The factor, R, indicates that through a plate of 1 centimeter thickness at a difference of temperature of 1°, for 1 square centimeter each, a quantity of heat passes which will increase the temperature of R gramme of water by 1°:

Copper	R = 0·918
Iron	R = 0·156
Steel	R = 0·062 to 0·111
Zinc	R = 0·292
Tin	R = 0·150
Lead	R = 0·079

Aluminum Glass.

M. Leon Appert, the distinguished glass expert, has contributed to the Moniteur de la Ceramique et de la Verrerie an able article in which he discusses the prominent part which, he thinks, alumina is destined to play in the manufacture of glass. "After having made numerous analytical tests of ancient window glass," says M. Appert, "I have arrived at the following conclusions, which appear to be of practical industrial value. The introduction of alumina into glass prevents or at least retards devitrification, which will occur always by the slow and repeated lowering of the temperature. The presence of alumina makes it possible that a part of the alkaline bases, soda or potash, may be replaced advantageously by an equal quantity of lime. Glass thus modified in its composition is more solid, less changeable and more elastic. The alumina can be added to the silica without any inconvenience in a proportion not exceeding 7 to 8 per cent. The fusibility of glass is slightly increased thereby, while its ductility is not sensibly diminished. The only inconvenience that can arise from the use of aluminum is that it will color the glass to some extent. This coloring does not result from the alumina itself, but from the action of the iron oxide, which is always found in it when in an impure condition. To sum up, the use of alumina, which permits its introduction only into bottle glass containing larger proportions of sand bases, should be extended equally to glass destined for other purposes, such as mirror glass, window glass, and especially drinking glasses. The quality of such glass would be greatly improved thereby. In the latter case the addition of alumina could best be accomplished if pure clay or, still better, if feldspar is used, which can be obtained at a low price. For the batch the purest materials possible should be selected among those destined to furnish the silica, soda and lime bases."

THE SHEFFIELD MOTOR VELOCIPEDE CAR.

This device is essentially a double gasoline engine, mounted on the Sheffield velocipede car, that is so familiar to all railroad men. To adapt the car to the purpose advantageously, some changes were of course necessary, but the general features of the car are retained.

While the car is light, the weight being under 250 pounds, it is exceedingly powerful, the motor being amply strong to carry a load of two men up any ordinary grade, and will run at a speed of 15 to 20 miles per hour. This, however, is not the limit of speed, as it can easily be run faster than is safe for so light a car.

The engine is a double one and has cylinders of proper size, fitted with trunk pistons, and is so arranged that an impulse or propelling movement is given the axle at every revolution. This impulse comes from the explosion of the proper mixture of air and gasoline vapor in the cylinders by an electric spark.

The gasoline is carried in a sealed copper reservoir, which will contain enough to run 75 miles of average road, though, of course, the conditions of grade or strong head winds may make it necessary to replenish sooner, a supply being carried in additional reservoir for the purpose. Proper mechanism regulates both the admission of gasoline and air to the cylinders, so that the proportion of each can be varied, which is important, and the device is therefore so constructed that the operator can see exactly how much of each is being used and can control them separately by suitable levers within convenient reach.

The spark is supplied by hermetically sealed chemical batteries and increased by suitable developing coil. A hand switch makes the connection, closing the circuit at will. The mechanism operating the sparking or contact points is exceedingly simple, and made of casehardened steel.

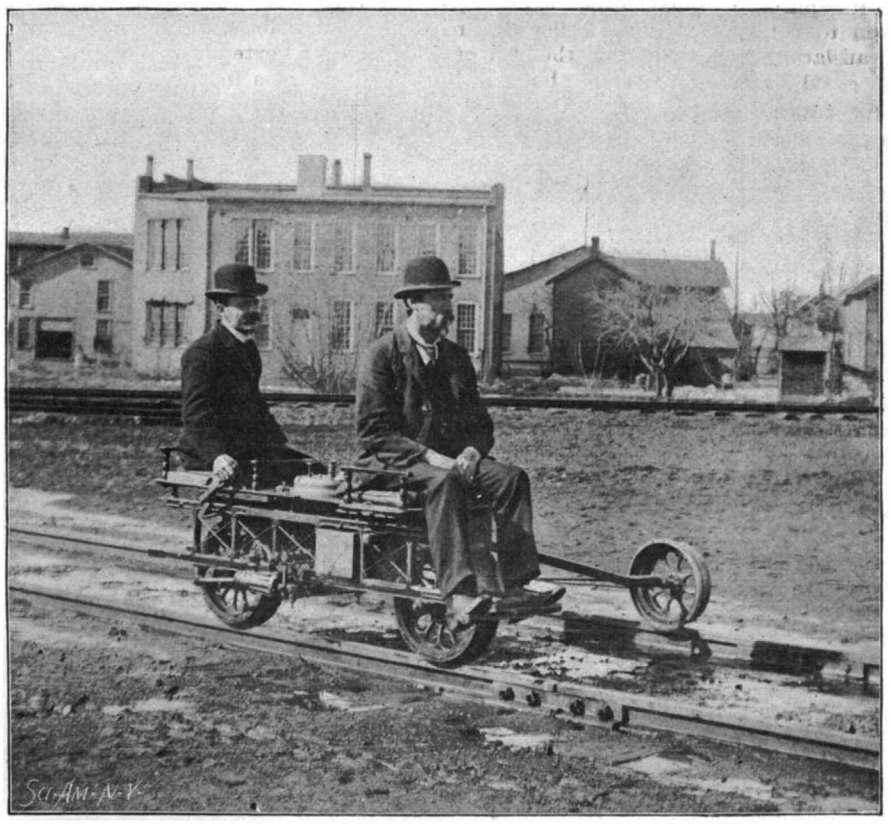
It is, therefore, hardly possible for it to get out of order, and the wear on these parts will be very slight.

In starting, gasoline is turned on, the air valve is opened, and the switch closed. It is necessary to run with the car a few steps to get it under motion, when the mechanism becomes automatic and the operator, stepping aboard, has only to regulate the proper amount of gasoline and air, to bring the speed to any desired point. The valve and other mechanism is carried directly upon the cylinders, thus making the engines and their parts self-contained, which is quite important in point of wear.

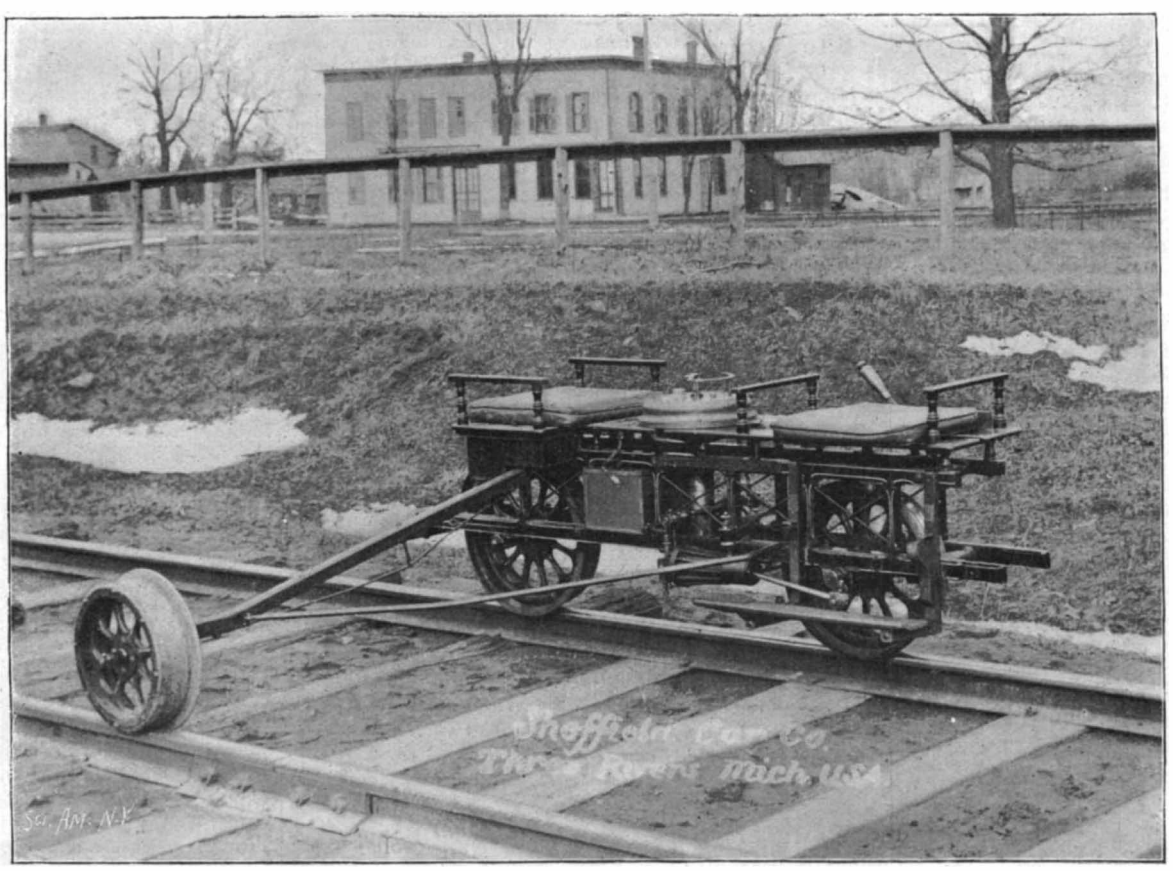
The leading and driving wheels are equipped with the Sheffield concave steel tires, which constantly tend to hold the car upon the track, even at high speed, although it should be always remembered that there is comparatively but little weight to hold the car down, and it is, therefore, not advisable to run the car at the top of its speed at any time. All wheels have forged steel hubs, wood centers, and steel tires.

The cars will carry two persons with ease, and can carry three in case of necessity. They are designed for the use of roadmasters, for track inspection, telegraph repair work, and whenever there is need for long trips and frequent stops between stations.

The cars are manufactured by the Sheffield Car Company, of Three Rivers, Mich.



RAILROAD INSPECTION CAR PROPELLED BY GASOLINE.



RAILROAD INSPECTION CAR PROPELLED BY GASOLINE.

ANOTHER powerful illustration of the constant tendency of the mountains to take a lower seat was afforded on May 30, when the village of Veinholz, near Brienz, in the Bernese Oberland, was partly destroyed by subsidence and landslips, caused by natural springs. The roads were destroyed, and railway communication has been interrupted.

The Influence of Glass on Wine.

Probably ninety-nine persons out of every hundred, taken at random, would ridicule the idea that the quality of the glass of which a bottle may be made can have any influence on the taste or keeping qualities of its contents. And yet that it does do so we have the best of evidence. We are not alluding to the influence of light shining through the flasks and its action on the substance contained, but the direct chemical reaction occurring between the glass and the material within the flask. Very recently the following case occurred in France. A wealthy retired merchant bought a lot of very costly and rare wine in casks, samples of the wine from each cask being given him by the wine merchant. The wine was delivered, and the new owner proceeded to have it racked off and bottled. Some time afterward some of the wine was brought to the table, and on tasting it the host detected a strange, unpleasant taste, which was also noticed by the guests. A fresh bottle was found to be similarly affected, and bottle after bottle was opened with the same result. An examination of the stock in the cellar developed the fact that every bottle of the recent purchase was spoiled. A suit was brought against the wine merchant, who declared that he had delivered the article exactly according to the samples furnished. On examining these latter they were found in excellent condition. It is unnecessary to go into details, but during the course of the action at law some of the bottles were produced in court, when it was found that the glass had become opaque. The bottles were handed over to a chemist, along with one of the lot purchased for bottling the wine, which had never been used. This is what the chemist found in the glass of the unused bottle: Silicic acid, 52·4; potash and soda, 4·4; lime, 32·1; argillaceous matter, iron, etc., 11·1. In the examination of the bottles that had been used, while the silicic acid and argillaceous material remained constant, or nearly so, the lime, potash, and soda were very much diminished, and it was made evident that they had passed into solution, forming compounds with the acid ingredients of the wine, decomposing the latter and rendering it unfit to drink. There is now a suit pending against the maker of the bottles.—National Druggist.

Waterways in Germany.

The interior canal in Germany proposed to connect the rivers Rhine, Weser, and Elbe, according to government investigation, will have a freight traffic of 3,000,000 tons per kilometer (0·625 mile). This insures 3 per cent interest on the investment. The cost of maintenance will be covered by a toll of ⅛ cent per ton-kilometer. Preliminary work has been done on this project for more than thirty years. The construction of the canal is now assured; yet not all opposition has been overcome. The latest protest comes from the Silesian coal mines. Freight on coal from Westphalia to Berlin via canal is figured at 6·96 marks per ton, while the combined rail and water freight from Upper Silesia to Berlin amounts to 9·35 marks, and from Lower Silesia to 7·15 marks per ton. It appears that Berlin consumes 1·5 million tons of coal a year, supplied as follows: By Silesia 1·2 million tons, by England 200,000 tons, Westphalia 90,000 tons, Saxonia 15,000 tons. The first effect of the canal would be the exclusion of English coal, so that an increase of the Westphalian business to 290,000 tons would not affect the Silesians. Again, an increase of 20 per cent in coal consumption is expected at Berlin by the industrial development fostered by the canal, where then the waterways from the industrial west will connect with those from the farming districts of the east. Of this increment of 300,000 tons, 200,000 would likely come from Westphalia and 100,000 tons from Silesia, so that the Westphalian coal importation into Berlin might reach 500,000 tons before it would hurt Silesian interests. On the other hand, the improvements in Silesia of the upper Oder River are now completed, and for the first time, on November 18, 1895, three vessels, carrying 200 tons of coal each, passed the locks at Kosel. It is expected that by the end of 1896 vessels carrying 400 tons will navigate the 40 mile stretch, Kosel-Stettin.—Railroad Gazette.

Thunder Storms at Sea are Nocturnal.

The greater frequency of thunder storms in the winter and at night around the coast of Scotland has been shown by Buchan, says Science. When thunder storms occur in New England in winter they are generally observed along the coast and after nightfall, as has been shown by records of the New England Meteorological Society. Now Meinardus, of the Deutsche Seewarte at Hamburg, finds even the thunder storms of the Bay of Bengal to have a distinct nocturnal maximum (Annalen der Hydrog., 1895, 506-511). It has been suggested by Grossmann and others that the cause of this contrast with thunder storms on land probably arises from the dependence of the maritime storms on instability produced by radiation and cooling of the upper surface of cloud sheets, which proceeds best at night, especially in winter nights; while local storms on the land arise from the overheating of lower layers of air close to the hot ground, and this condition has its maximum on summer afternoons.

Notice to Our Readers.

In order to obtain the opinion of the readers of the SCIENTIFIC AMERICAN as to what invention *introduced within the last fifty years* has conferred the greatest benefit upon mankind, we publish the accompanying card, which please cut out and return to the editor. Those who preserve the paper for binding and do not desire to deface their files, or who read this notice at a library, will please answer by postal card. It is desired to get as full a vote as possible. The result of the vote will be published in the *Special 50th Anniversary Number of the* SCIENTIFIC AMERICAN *on July 25.*

Editor of the SCIENTIFIC AMERICAN.

Dear Sir:

I consider that.....

.....

invented by.....

has conferred the greatest benefit upon mankind.

Name.....

Address .....

Correspondence.

Barisal Guns and Mist Pouffers.

To the Editor of the SCIENTIFIC AMERICAN:

In response to the request of SCIENTIFIC AMERICAN, page 403, June 27, 1896, in the article entitled "Barisal Guns and Mist Pouffers," I would say that such phenomena are very common on this coast. My attention was first called to it some twenty or more years ago while acting as engineer of a towboat, it being our custom to lie three or four miles off the mouth of the river (the Piscataqua River), or about half way between Portsmouth light and the Isles of Shoals, and await the appearance of inward bound vessels. At these times I have frequently heard the sounds mentioned occurring at irregular intervals, and so far as my memory serves me, during the prevalence of a light southerly wind or a calm, and in warm, summer weather. They had a dull muffled sound, which appeared much like the report of a cannon at a very long distance.

A former shipmate informs me that he has heard these sounds all along the coast from Cape Ann to the eastern part of Maine, and frequently at the Isles of Shoals, especially a short time before sunset in hot weather; he thinks sometimes as often as three or four reports per minute, but he has never observed it at night or in winter.

The depth of water between the mouth of this river and the Isles of Shoals, a distance of about eight miles, varies, I think, from nine to about eighteen fathoms. LEVI W. LORD.

Portsmouth, N. H., June 28, 1896.

Sleeplessness.

It was once a custom in the more remote parts of Scotland to employ bards to rehearse to great men the verses of distinguished poets as a means of promoting sleep, for, as it has been observed, "anything that catches the attention, such as soft music, or any monotonous sound, as the murmuring of a rivulet, will entice sleep." But, good as many of the experiments may be for driving away wakefulness, experience would prove that what engenders sleep in one person acts in the very opposite direction on another. Thus, on some occasions Boerhaave, in order to procure sleep for his patient, directed water to be placed in such a position that it was continually dropping on a brass pan; a contrivance which, in many cases, had the reverse effect of keeping the person awake. And in adopting such artificial methods, Sir Henry Holland has observed, "These often fail from the cause." When they succeed, it depends on the exhaustion being more complete, or the mind being rapidly carried from one object to another, a desultory state of this kind being apparently one of the conditions more favorable to the effect desired. Sometimes, however, every means thought of for inducing sleep fail—

> "And in the calmest and the stillest night,
> With all appliances and means to boot,
> Denies it to a king."

Southey's method of insuring a good night's rest was a simple one, for, writing to his friend James White, he said, "Follow my practice of making your latest employment in the day something unconnected with its other pursuits, and you will be able to lay your head upon the pillow like a child," which is much to the same purport as Tissot's recommendation "to solicit sleep by a seasonable dismissal of business and care." In the same way Kent, finding it impossible to procure sleep at his accustomed hour, diverted his attention to some indifferent subject, such as the history and writings of Cicero; whereby he not only got the better of the thoughts which kept him awake, but was finally overcome by drowsiness—which reminds us of the missionary who, troubled with sleeplessness, repeated the Lord's Prayer till Satan sent him to sleep to get rid of it; and he adds that he never found the receipt to fail. Some have obtained the same result by a recourse to figures, either repeating the multiplication table or working out some simple problem. Much, it is affirmed, may be effected by resolution and firmness of mind. It is related that the Abbe Jaria, who acquired some reputation through his power of inducing sleep, was in the habit of placing his patient in an armchair, and after telling him to shut his eyes and collect his thoughts, he said, in a strong voice, "Dormez," which was invariably successful. Hufeland, too, maintained that by perseverance and firmness of mind great power may be obtained over the thoughts.

Some of the artifices for curing sleeplessness have been equally curious and ingenious. The famous engineer Brindley often saw the experiment tried of a man extending himself across the large stone of a corn mill, and gradually falling asleep by the stone whirling round before it gained its full velocity; and Asclepiades, among his many inventions for improving the art of physic, recommended the plan of pensile or suspended beds, by which the person was rocked asleep. Dr. Franklin was a firm believer in the air bath as a means of procuring refreshing sleep; and in Adair's "Essay on Diet and Regimen" minute directions are given for the use of hot water as an effectual remedy; whereas Strueve, in his "Asthenology," speaks of electricity as promoting sleep, and tells of persons who have been cured of insomnia through making use of an electric bath. Among the natives of India it has long been customary to employ a servant to gently tickle the soles of the feet till sleep takes place; and Lord Bacon indirectly refers to the custom, and writes, "It is received and confirmed by daily experience that the soles of the feet have great affinity with the head, and soporiferous medicines applied unto them provoke sleep." Chinese medicine has many curious ways of producing sleep, which would scarcely find acceptance in this country. But rubbing the soles of the feet is recommended, because it is said that "the middle of the sole of the foot is as the outlet and opening of a great many sources of the spirits dispersed all over the body." The Hindoos maintain that to sleep with the head to the north will cause one's days to be shortened, whereas in our own and other countries this position has oftentimes been adopted by persons suffering from sleeplessness. Thus, some years ago, it was announced to the Scottish Curative Mesmeric Association that persons wishing to secure sleep should lie with their heads to the north and not on any account toward the west. It is also stated by an eminent physician in Scotland that when he failed by every other prescription to bring sleep to invalid children he recommended their little beds to be turned due north and south, the head of the child being placed toward the north—a process which had never failed to produce sleep. Some, again, have insisted that a certain amount of cold is a cure for sleeplessness, a notion which was advocated in olden times. Mr. Alfred Snell found the application of cold produced sleep when other remedies failed, and many a time, he tells us, he has obtained for his patient rest by applying a little cold water to the top of the brain when every other means had been of no avail. In short, persons suffering from want of sleep have been compelled to try all kinds of expedients; for, as Haydon once remarked, after a sleepless night, "You get up with a black veil over your fancy, through which you see all things."

Among some of the well known victims of sleeplessness may be mentioned Pope, who, when he was at work on his Iliad, was beside himself with sleeplessness; and both Smollett and Cowper were afflicted with the same malady, as also John Leech. Carlyle, at times, was more or less troubled with insomnia, and on such occasions generally sought relief in his pipe. But, like Leech, Carlyle was acutely sensible to every kind of sound, and the slightest noise would decompose him for the night. In the same way Thackeray was keenly alive to any jangling, inharmonious sounds, and to him, when going to sleep, there was no greater friction than the monotonous noises of street life. Byron was much troubled with sleeplessness, and one night, it is said, "suffered horribly," only allaying his distress by incessant draughts of soda water. Occasionally Charles Dickens could not sleep, and at such times he was in the habit of getting up and taking a long walk—a stringent remedy which he used to say brought him his required sleep. Writing of Chillingworth, Lord Clarendon once remarked that "his only unhappiness proceeded from his sleeping too little and thinking too much," which must be regarded as equally true of only too many brain workers. On the other hand, it has been oftentimes acknowledged a strange paradox that whereas many are resorting to every contrivance to coax and promote sleep, others are employing means to check it. Boerhaave, for instance, it is said, after one of his intense studies did not close his eyes for six weeks, and Descrozilles, according to his own confession, only allowed himself two hours in twenty-four. And we may mention that indefatigable worker Michael Angelo, who, after passing the greater part of the day in his studio, would often rise at night to resume his labors, fixing a lamp on the top of his pasteboard cap "to supply the light which guided his marvelous chisel." But, in only too many instances, by such means, habitual sleeplessness has been the penalty, as happened to Claude Bordelieu. Unable to get rest, he resorted to opium; and it is related of Goldoni that, after writing as many as sixteen plays in a single year, "he paid the penalty during the rest of his life." Although men like Jeremy Taylor and Richard Baxter were content with three or four hours' sleep, few persons can dispense with the requisite amount, being more or less inclined to agree with old Dr. Fowler, of Salisbury, who used to say that to live a long life one must "lie abed in the morning until you are done enough."—London Standard.

From What Countries do the Illiterates Come?

The nations that will be affected by probable legislation are those from which the undesirable immigration comes. The following table, compiled by Congressman Bartholdt, will give a clear idea of the effect of a bill now before Congress if it should become a law:

Nationalities.	Percentage of Illiterates.
Portugal	67·35
Italy	52·93
Galicia and Bukowina	45·68
Poland	39·82
Hungary	37·69
Russia (proper)	36·42
Other Austria	32·70
Greece	25·18
Roumania	17·75
Belgium	15·22
Turkey in Europe	14·79
Wales	10·43
Bohemia and Moravia	8·98
Spain	8·71
Ireland	7·27
Finland	3·58
France (including Corsica)	3·50
England	3·49
Netherlands	3·38
Scotland	2·83
Germany	2·49
Norway	1·02
Sweden	0·74
Switzerland	0·60
Denmark	0·49

Many sections of this country need immigration, and it would be wise to encourage it if the people are desirable, that is, of a kind that can be assimilated. If the immigrants could be induced to locate and stay where they are wanted and to keep away from the sections where they are not wanted, the problem would solve itself. Unfortunately, this is not possible. If they are admitted to the country, they will go where they want to go and not where the people want them. This being the fact, repression seems the only relief for the sections that are oversupplied. If repression must be had, this bill seems to offer the best plan yet proposed for eliminating the undesirable classes.

Fiftieth Anniversary of the Telegraph in Belgium.

S. F. B. Morse, one of the best known electrical men in Chicago, often receives letters and verbal inquiries relating to his famous grandfather of the same name, who first put into practice the art of electric telegraphy. A late letter from Belgium shows that at the approaching celebration of the first half century of telegraphic service in that country the name and fame of Morse will be appropriately honored. This interesting communication is from J. Banneux, the engineer-in-chief and director of the state telegraphs of Belgium, and is dated at Brussels, May 20, 1896. It is as follows, says the Western Electrician:

The administration of telegraphs of Belgium will celebrate on September 9 next the fiftieth anniversary of the establishment of telegraphic service in the country. On that occasion I would be pleased to exhibit to those familiar with his apparatus an authentic portrait of the illustrious American inventor Morse.

Again, one of the noted painters of the day, charged by the government with the production of an historical composition to ornament the walls of the postal and telegraph stations in Brussels, has pictured Prof. Morse among his principal figures, and to this end he seeks to obtain as faithful a likeness as possible. We will therefore be very grateful to you if you can find it within your power to send us two good photographs of your illustrious grandfather, especially those which represent him in the last years of his life.

BUSINESS says: An owner of a process or invention for manufacturing an article, which was kept from all but confidential employes, may restrain former employes from disclosing, or using in a rival establishment, their knowledge of same; and it is immaterial that there was no written contract between them, or that at the commencement of their employment the employes were minors, and performed comparatively unimportant duties.

TESTING THE PARTS OF A MODERN BICYCLE.

(Continued from first page.)

tails of the machines used for effecting these tests, and we believe they will be of interest to our readers.

The bridge engineer, weight not having to be measured by ounces, allows an ample margin for safety in his work, yet prescribes for his steel the most rigid requirements. With the excessively small factor of safety of a bicycle, the Pope Manufacturing Company have felt that such exactitude of requirement was more than ever essential. Accordingly the steel used in the construction of their wheel is ordered by certain data that years of testing have shown to be proper, and specimens have to be supplied for examination. It is analyzed in the laboratory, its percentage of carbon, phosphorus, sulphur and nickel being determined, and none is accepted that does not come within a very rigid limit of toleration. The records of this testing department must be valuable beyond price.

Testing the crude material for acceptance is a small part of the work of the testing department. Every portion of the wheel is constantly being tried under all sorts of conditions as a guide to manufacture and design. To apply direct tensile, compressive and transverse strains, the great testing machine, an Emery hydraulic machine, built by the William Sellers Company, is used.

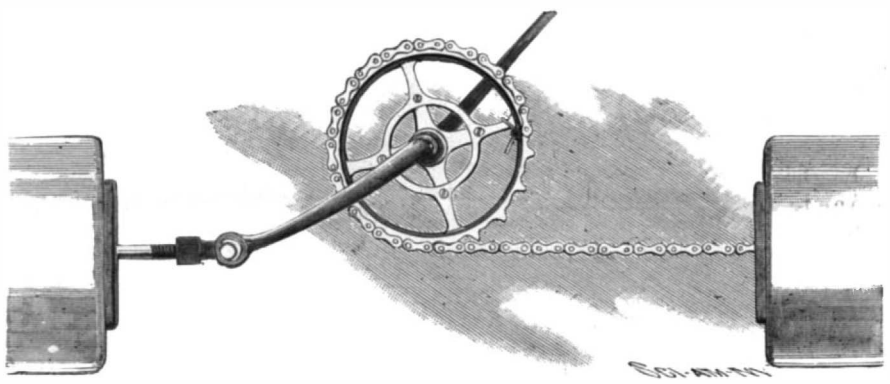
This machine has a capacity of 100,000 pounds strain and attains an accuracy of an ounce or less. The machine is a model on a small scale of the great Watertown Arsenal machine, already described in our columns, and represents the highest order of testing mechanism that has ever been devised. In the large illustration we show the great engine with its elaborate system of weight mechanism in the case ready for work, and another cut shows a very ingenious piece of apparatus used to measure the elongation of a specimen before fracture. An accurate steel roller is held between two planes of steel. These planes can move over each other, the roller rolling in one or in the other direction. At the outer ends of the planes of steel are V-shaped knife edges and points used to afford a fixed bearing upon the sample. The roller carries an aluminum wheel with graduated periphery. As the bearing points are pulled apart, the roller turns, the wheel rotates and the amount of its rotation measures the elongation or separation of the points to one ten-thousandth of an inch. Spoke wire is all carefully tested, cranks, sprockets and all parts of the wheel and chain are here subjected to various classes of strains. One of the cuts shows the test of the combined crank, sprocket and chain, the test being, of course, always pushed to destruction. Another illustration shows the tubing test on the vibratory strain testing machine. The piece of tubing is rotated in a lathe, a counting indicator being attached to its end to show the number of revolutions which it makes. A weight, varying from 25 pounds to 225 pounds, rests so as to produce a deflection of 0·09 to 0·30 inch. The tube rotates by the hour, the line of deflection constantly varying and passing through the 360 degrees of a full circle at every rotation, and after millions of turns it succumbs. The number of turns indicates the quality. This machine has been in constant operation for four years, and has demonstrated that high carbon steel is superior to all other materials, except nickel steel, for the tubing for bicycle frames. The latter, which works in the drawing mill with the greatest difficulty, seems to surpass everything yet tried in its power to resist strains, and is used for the most critical portions of the Columbia bicycle. Ordinary tubing, such as is purchased in the open market, yields long before the high carbon Columbia tubing.

The wheel test, shown in another cut, speaks for itself. Here a regularly mounted wheel is pressed by a weight of 180 pounds against a rotating wheel on whose perimeter are secured blocks so as to represent as it rotates the roughest kind of road. Making 106 revolutions per minute, a speed equivalent to 13½ miles is given to the wheel, and the test, if carried on for a long enough period, infallibly reveals any weakness in the specimen, and locates it.

The laboratory, with enameled brick walls, Becker balance, evaporation chambers and the most modern appliances, is a model for chemists. The whole department was organized under consultation with leading experts and investigators at home and abroad. Its operations are in charge of Mr. Henry Souther, formerly of the Pennsylvania Steel Company.

In addition to the testing department, the uniformity of workmanship is maintained by means of an elaborate inspection of each part of the bicycle after every operation through which the work passes. Experts in each process are employed for the purpose, and there are at present 584 different inspections required upon a Columbia and its component parts, not including the final inspection and examination of the finished bicycle before shipment.

All of this work, and the design and preparation of improvements and new models, is in charge of a council of expert engineers and mechanics, who hold regular meetings and to whom is left the decision of every detail of design and the processes of manufacture. One man alone is not deemed to be fitted to deal with so complicated a problem as the modern bicycle, and, therefore, safety is sought in a multitude of counselors.



TESTING CRANK, SPROCKET AND CHAIN.

Vitality of the Diphtheritic Bacillus Out of the Body.

Flugge, in his Grundriss der Hygiene, published in 1889, stated that the microbes of diphtheria retained their virulence for ten days in the form of dust and from four to six weeks if dried in dense layers; but in a paper on the means by which the disease is spread, which appeared in the Archiv fur Hygiene in 1894, he expresses his incredulity as to aerial diffusion of diphtheria beyond the range of personal intercourse, on the ground that the degree of desiccation required for the floating and conveyance of the bacilli in currents of air would be fatal to them.

Roux and Yersin and Pernice and Scagliosi had carried out some experiments with portions of the membrane, but Carlo Reyes, deeming these unsatisfactory, since it was not by such means but rather by the saliva, mucous discharges, and similar fluids that the infection took place, undertook an inquiry into the subject, using pieces of linen or cotton, silk, paper, sand, and finely pulverized and sifted earth, which he saturated with emulsions in water of pure cultures of great virulence. These materials were allowed to dry spontaneously and were then exposed to light or were kept in darkness in air of the normal humidity at ordinary temperatures, or maintained in a state of saturation; and in atmospheres artificially dried by H_2SO_4 or kept at a constant temperature of 37° C. His results, which appear in the Annali d'Igiene Sperimentale, show that in chemically and absolutely dried air Loffler's bacilli died in all cases within a few hours, forty-eight at the most; that light had, as a rule, but little influence; that under other conditions they retained their vitality on silk and paper for a few days only in dry, and for about a week in moist air.—Lancet.

Should One Sleep After Eating?

We would not now revert to this oft-discussed question to give any one's theoretical views or personal beliefs in the matter, or to bring forward the familiar argument that because animals sleep just after they have eaten, hence the human animal should do the same says the Medical Record. Dr. Schule, of Fribourg (La Med. Mod., January 15, 1896), has, however, approached the subject from the chemico-experimental side, and his results are worthy of record. Having analyzed the stomach's contents in two normal subjects a few hours after meals, some of which were followed by sleep and others not, he finds that sleep has for its constant effect the weakening of the stomach's motility and at the same time there is an increase in the acidity of the gastric juice. On the other hand, simple repose in the horizontal position stimulates the motive function of the stomach, but does not increase the acidity of gastric juice. The conclusion is hence reached that, while one should stretch himself out for a rest in the horizontal decubitus after a hearty meal, he should resist the tempting Morpheus, especially if there be present a dilated state of the stomach or if its juices be hyperacid.

Swedish Exhibition.

Kuhlow's German Trade Review states that the arrangements for the Stockholm Exhibition have been completed. It will take place in 1897, and everything is now being done to make it as representative and comprehensive as possible. Matters are being pushed ahead with much vigor, and all parts of the country appear to take the keenest and most active interest in the success of the undertaking. The exhibition will contain sections devoted to engineering, machinery, shipbuilding, electricity, scientific appliances, etc. It is added that the site of the exhibition, about which there was at one time much disagreement, has now been decided in a satisfactory manner.

Glass Blowing—Offhand Work.

The art of glass blowing before the lamp is now being carried on in the Royal Prussian Museum of Mechanical Arts in the same manner in which it was practiced by the old Venetians during the most flourishing period of their glass industry. The famous glass artist, Fr. Zitzmann, of Wiesbaden, occupies a room in the museum, in which he produces from his stock of glass tubes of different strength and color by blowing those fine and delicate drinking vessels, carafes, vases, etc., as are seen in the numerous collections of old Venetian glass. Similar products of more recent date are being manufactured again in Venice and Murano since 1860, when the industry was revived by Salviati, and by the Rhenish Glass Co. of Cologne—Ehrenfeld. These factories are operating on a large scale, and with the assistance of all the appliances that modern technology can furnish. Zitzmann, on the other hand, works without any moulds or patterns, using nothing but a few absolutely necessary tools. Otherwise he relies entirely on his sense of form, which is developed to extraordinary keenness. It is extremely interesting to watch him at his work, and observe how fast and sure the numerous articles, so different in shape, size and decoration, are created by him. A large number of his products are on exhibition in the museum. While the drinking glasses destined for use show forms just and delicate and elegant as pure, the artist has been tempted by his great virtuosity in overcoming all technical difficulties to overload some of the larger ornamental vessels exhibited with too much by-work. This ought to be avoided, if the article shall not lose its practical value. The demand for such fancy glassware in Europe is very fair at present.

Conversion of a Tree into a Newspaper in One Hundred and Forty-five Minutes.

We take from the Centralblatt fur Oesterreich-ungarische Papier-industrie the following account of a curious experiment:

A very interesting experiment was made on April 17 last at Messrs. Menzel & Company's paper and wood pulp manufactory, at Elsenthal, in order to ascertain what was the shortest space of time in which it was possible to convert the wood of a standing tree into paper, and the latter into a journal ready for delivery. This experiment is of extreme importance, because it shows what rapidity can be attained by the concurrence of practical machines and favorable conditions.

Three trees were felled in a forest near the establishment at thirty-five minutes past seven in the presence of two of the owners of the manufactory and a notary whom they had called upon to certify as to the authenticity of the experiment. These trees were carried to the manufactory, where they were cut into pieces 12 inches in length, which were then decorticated and split. The wood thus prepared was afterward raised by an elevator to the five defibrators of the works. The wood pulp produced by these machines was then put into a vat, where it was mixed with the necessary materials. This process finished, the liquid pulp was sent to the paper machine. At thirty-four minutes past nine in the morning, the first sheet of paper was finished. The entire manufacture had thus consumed but one hour and fifty-nine minutes.

The owners of the manufactory, accompanied by the notary, then took a few of the sheets to a printing office situated at a distance of about two and a half miles from the works. At ten o'clock, a copy of the printed journal was in the hands of the party; so that it had taken two hours and twenty-five minutes to convert the wood of a standing tree into a journal ready for delivery.

It must be added that, during the course of the manufacture, there occurred a few interruptions which might be avoided at another time, and that, in the opinion of the two manufacturers, had it not been for this, twenty minutes might have been gained.—Moniteur de la Papeterie.

A Costly Epidemic.

The ravages of the rinderpest in South Africa are said to be more appalling than any cattle plague which has affected the region within living memory. As an instance of the devastation wrought in Bechuanaland, it is reported that Khama, the paramount chief, who, with Bathoen and Sebele, recently visited England, has lost from his private herds alone, 8,000 head of cattle. At Pitsani, at last advices, the cattle were dying by the hundred daily, and Dr. Hutcheon, who has just concluded a tour of inspection, is reported to have declared that unless something occurs to stay the infection—which seems very unlikely—not a single cow will, within a few weeks, be left in the Bechuanaland Protectorate. It is estimated that the cost of the plague will be over £5,000,000. To the South African native cattle are a medium of exchange and staple diet.—London Daily News.

An Inscription on the Parthenon.

Consul Horton, of Athens, writes to the consular department, March 5, 1896: I have to report an archæological discovery of extreme interest recently made by a student in the American School of Classical Studies, of this city. I refer to the deciphering of an inscription on the architrave at the east end of the Parthenon. The face of the eastern architrave is thickly dotted with small holes, and for many years scholars have been under the impression that these holes were the traces of nails which had once held fast the letters of an inscription. It had also been suggested from time to time that a study of the nail holes might give some clew as to the letters themselves, which long ago were torn down, doubtless for the sake of the metal which they contained.

The difficulty of such a task, which has defied the archæologists until now, is evident. The architrave is about 100 feet long, and the holes extend over 90 feet of its length. They dot thickly spaces from 3 to 4 feet in length, between which are circular blanks, where shields about 4 feet in diameter hung at intervals. Various attempts have been made, chiefly by German archæologists, to "read the nail holes." The most notable of the methods employed have been photography and transcribing with the aid of magnifying glasses.

No attempt met with any success until Mr. Eugene Plumb Andrews, of the American School, hit upon a practical method. He threw a rope over the eastern end of the ruined building, and pulled up a rope ladder. Then he suspended a swing in front of the architrave 37 feet from the marble step below, and took what is known as a "squeeze" of the holes. His method was ingenious. Damp "squeeze" paper was first applied to the surface of the stone, and patted well down with a brush. The paper broke through over the holes. Mr. Andrews then forced extra strips into each of the openings and lapped their ends down on the large sheet. When he had thus treated all the holes, he laid another sheet over the first to hold the ends of the strips in place, and pounded all together into one solid sheet, on which the exact position of the nail holes was represented by protuberances.

Mr. Andrews was about one and a half months making his squeezes, twelve in all, representing the twelve spaces between the shields. Then he arranged them in order and began studying them. His greatest difficulty occurred at the start. He did not know whether the inscription ran straight across all the squeezes or whether the squeezes were to be read separately, as the pages of a book.

Moreover, the ancient workman who had nailed up the letters had made numerous mistakes, so that many of the holes were treacherous and confusing.

Mr. Andrews, however, persisted, and light began to dawn. He found, for instance, that three holes placed thus ∴ indicated either a △ or a Λ, the metal letter having been nailed at its three corners, and that three holes placed thus ∘ ⁘ showed where an O had been nailed.

He made a transcript of the squeezes on a long strip of paper, marking the locality of the protuberances with dots, and then attempted to form the ancient letters by drawing lines from dot to dot. Finally, he deciphered the word "Autokratora," which proved that the inscription had been Roman, and not, as formerly supposed, of an earlier date. The word "Nerona" threw further light on the matter.

Here was evidently the dedication of a statue to the Emperor Nero, and the reading was simplified by a study of other similar inscriptions, as the same phraseology is used in all. The inscription, as Mr. Andrews reads it, is translated substantially as follows:

"The council of the Areopagus and the council of the six hundred and the people of the Athenians erect this statue of the Very Great Emperor Nero Cæsar Claudius Sevastos Germanicus, the Son of God, during the generalship over the hoplites for the eighth time of Claudius Novius, the overseer and lawgiver, son of Philinos, during the priestess-ship of . . . daughter of . . . ."

It appears, therefore, that the inscription recorded the erection of a statue to Nero, probably in the Parthenon.

As it is known from another inscription that Claudius Novius was general for the eighth time in the year A. D. 61, we have the exact date of this inscription.

Mr. Andrews graduated at Cornell in 1895, and holds the university fellowship for one year. There are at present twelve students in the American School.

RECENTLY DISCOVERED BUST OF LOUIS XVII.

BY HENRI MORAND.

During the "Reign of Terror," it will be remembered that Louis XVI and Marie Antoinette, as well as their son, the Dauphin, were held prisoners in the Temple. On the 21st of January, 1793, the King was beheaded, and the Queen met with the same fate shortly afterward. The Dauphin was intrusted to the care of the cruel shoemaker jailer, Simon, who made the child the

BOURBON WAX DOLL OF THE LAST CENTURY IN NANTUCKET MUSEUM.

subject of his ill treatment, and, it is said, caused his death on the 8th of June, 1795.

Many, however, believed that the body of a poor boy was substituted for that of the Dauphin, and that, with enormous sums, the Emperor of Austria, his grandfather, succeeded in bribing Simon, who allowed the child to escape to that country, where he was brought up by a village watchmaker, of the name of Neuendorf, who taught him his trade. At the age of twenty, having obtained cognizance of his high birth, he tried to have himself recognized by the court of Austria, but was ignored.

CONTEMPORANEOUS PORTRAIT OF LOUIS XVII.

He then returned to the village of his youth, married, and later removed to Holland, where he and his family were protected by a secret hand. The sons of Neuendorf entered the Hollandish army and became officers. In the cemetery of Maestrecht his tomb bears, it is said, the following inscription: "Ici repose Louis XVII, roi de France, né à Versailles le 1785, mort à Maestrecht. Priez pour lui."

A book was published, years ago, by Harper & Company, the title of which was: "Have we a King Among Us?" The story tells us that the Dauphin was taken to Florida and brought up by an Indian family. One day, as the Dauphin was taking a bath, he struck his head against a rock. This accident made him forget his past history. Later he was adopted by a missioner among the Indians, followed the same profession, and was known as Rev. Mr. Williams.

Nantucket, Mass., has also its "Dauphin" in the "History Rooms," which is supposed to be a facsimile of Louis XVII when a baby. It is a wax doll, natural size, brought back from France by Captain Coffin, to his daughter, in 1789. There seems to be no doubt that the features are those of the Bourbon family.

A few months ago, as some workmen were making room for some improvements in the palace of Versailles, they discovered the defaced bust of a child. The nose, mouth, and chin broken, undoubtedly by the vandals of the French revolution. After many researches by scientific people, Monsieur de Nolhac, the custodian of the Musée de Versailles and author of "La reine Marie Antoinette," discovered, beyond doubt, that it was no less than the Dauphin of France, or Louis XVII, and the work of one of the most distinguished French sculptors of the time, Deseine.

The French government had the mutilated parts restored and it is now in the above named museum.

BUST OF LOUIS XVII RECENTLY DISCOVERED.

Recovery of Silver and Gold from Photographic Residues.

The American Druggist translates from the Neueste Erfindungen und Erfahrungen an original contribution by Weidert as follows:

Analysis of finished photographs shows that only a very small portion of the gold and silver used in their preparation remain in the finished print, by far the greater portion of the metals being retained in the baths.

The methods of recovery of silver residues vary with their character. The silver from old fixing baths can be recovered in the simplest manner. By hanging strips of copper or zinc in the baths the silver will be deposited on the strips in a grayish black powder or in small leaflets of a metallic luster. This method, however, is tedious and extravagant, since a large portion of the silver remains in this solution. A somewhat better method is to agitate the bath after the addition of zinc dust, and then filter off the precipitate, wash, and then treat with diluted sulphuric or hydrochloric acid in order to dissolve out the valueless zinc. This process also is not particularly to be commended.

It is generally customary to precipitate the silver with an aqueous solution of potassium sulphide, and drain the brownish black sulphide of silver on a muslin filter and dry it. In order to reduce this to silver, it is fused with calcined soda in a porcelain or graphite crucible and poured upon an iron or marble slab.

The sulphide of silver can also be roasted in the atmosphere, then mixed with three or four parts of potassium nitrate and introduced carefully in small portions into a glowing crucible.

In order to recover the silver from the paper clippings, etc., which have not been "fixed," the paper residue should be cut into small pieces and put for two hours into a bottle where the old fixing bath is kept. This bath is then filtered and treated as above directed.

Since all photographic silver paper contains, in addition to the silver chloride, easibly soluble silver nitrate, the first wash water from the toning in particular should be collected and the silver precipitated by the addition of hydrochloric acid and sodium chloride. After drying, this should be reduced in the same manner as the silver sulphide, by the means of potassium or sodium nitrate. One may also pour over this precipitate a five per cent solution of hydrochloric or sulphuric acid, and then hang in the solution a piece of zinc, whereupon the silver is thrown down in the metallic form.

Gold is generally precipitated from the baths by addition of hydrochloric acid and a solution of ferrous sulphate. The gold is thrown down as a brownish red powder, which should be washed well and fused. Occasionally ammonium chloride is added in excess to the toning bath with some hydrochloric acid. The gold then precipitates out after a short time (if in a warm place and particularly in light) in the form of metallic glistening scales.

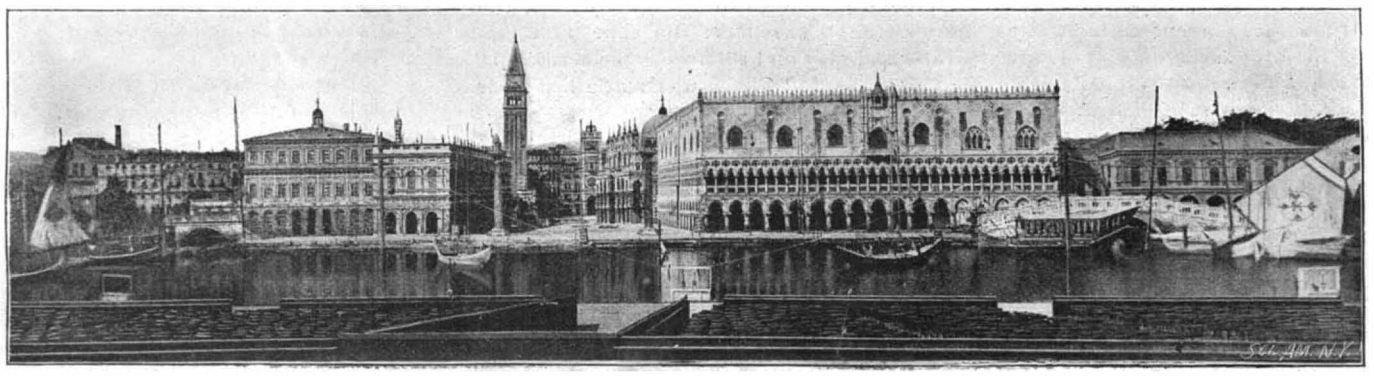
A CRUSADE against hokey-pokey has been going on in London for some years past, shocking accounts of the millions of microbes found in the mixture being published from time to time. A member of the health board, however, analyzed a strawberry ice cream bought of one of the most fashionable West End caterers recently, and found that it contained from eight to fourteen million bacteria to the cubic centimeter, among them the bacillus coli, which is a worse record than that of the Italian street venders.

FIREWORKS AS AN ADJUNCT TO DRAMATIC ENTERTAINMENT.

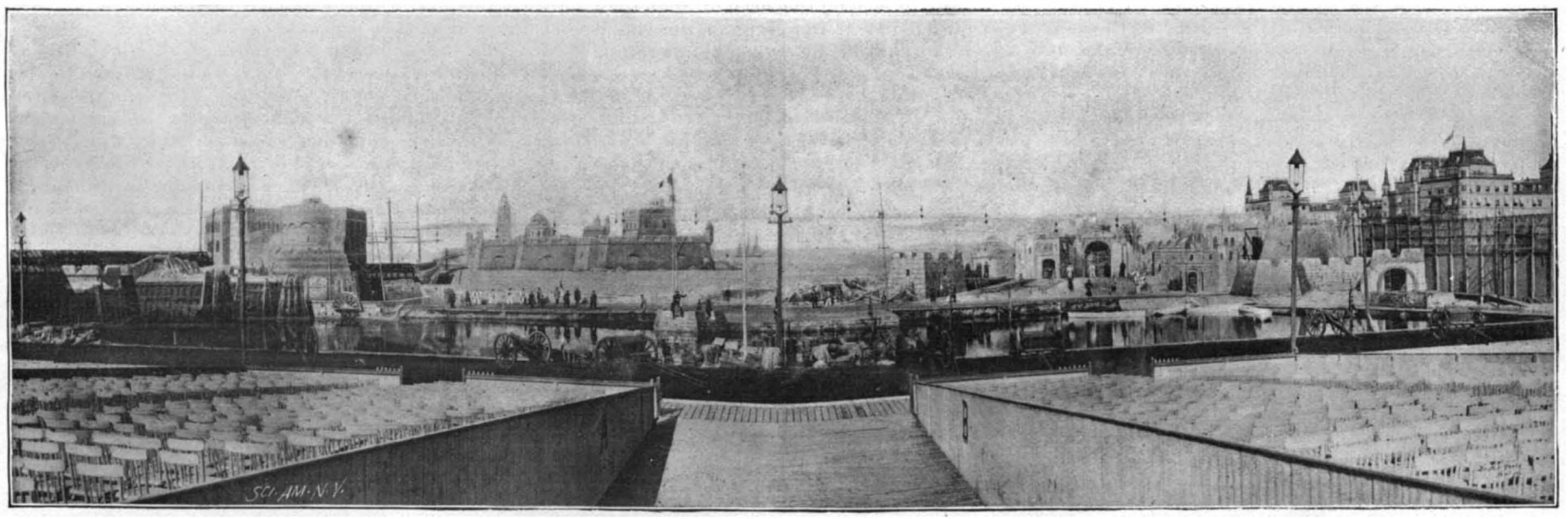
The love of show and the spectacular is inherent in human nature. Games and entertainments on a large scale always have appealed to the popular taste. An important factor in such spectacles now is the display of fireworks, in the love of which the American can sympathize with the Oriental. As far back as 1879, Mr. James Pain gave his first spectacular production at Manhattan Beach, one of New York's most popular resorts, and since that time their popularity has greatly increased. It is perhaps more proper to speak of these entertainments as fireworks with dramatic accessories than to call it a drama with fireworks as an accessory; for the raison d'être of the entire performance depends, not on the loosely hung together plot, but on a gigantic display of fireworks, which should be accompanied by enough of realistic stage setting and dramatic performance to give a good excuse for the display. The Pain Pyro-Spectacle Company, of New York City, have a large number of these productions, of which about seven are in use at one time. These are moved about from place to place, so that, in the course of the season, some thirty or forty cities are visited, the length of the stay varying from one week to a whole season. Strange as it may appear, these mammoth plays, as regards their scenery, are interchangeable as in any theater, the grounds in which the scenery is installed being of the same general dimensions in all cases. This, of course, greatly simplifies a change of performance.

An amphitheater is provided for the spectators in a rectangular inclosure which may seat as many as 10,000 persons. These inclosures are usually open to the sky, thus adding to the illusion. The seats slope away until the water is reached. Here will be found an artificial lake, usually 318 feet long and 150 feet wide, the width of the entire stage being about 350 feet. Behind the pond is a stage mounted with set scenes. Of course, owing to the distance and darkness, the refinements of acting would be entirely lost. The management, therefore, depends almost entirely upon the spectacular, the cast including hundreds of performers, including companies of clever gymnasts and acrobats.

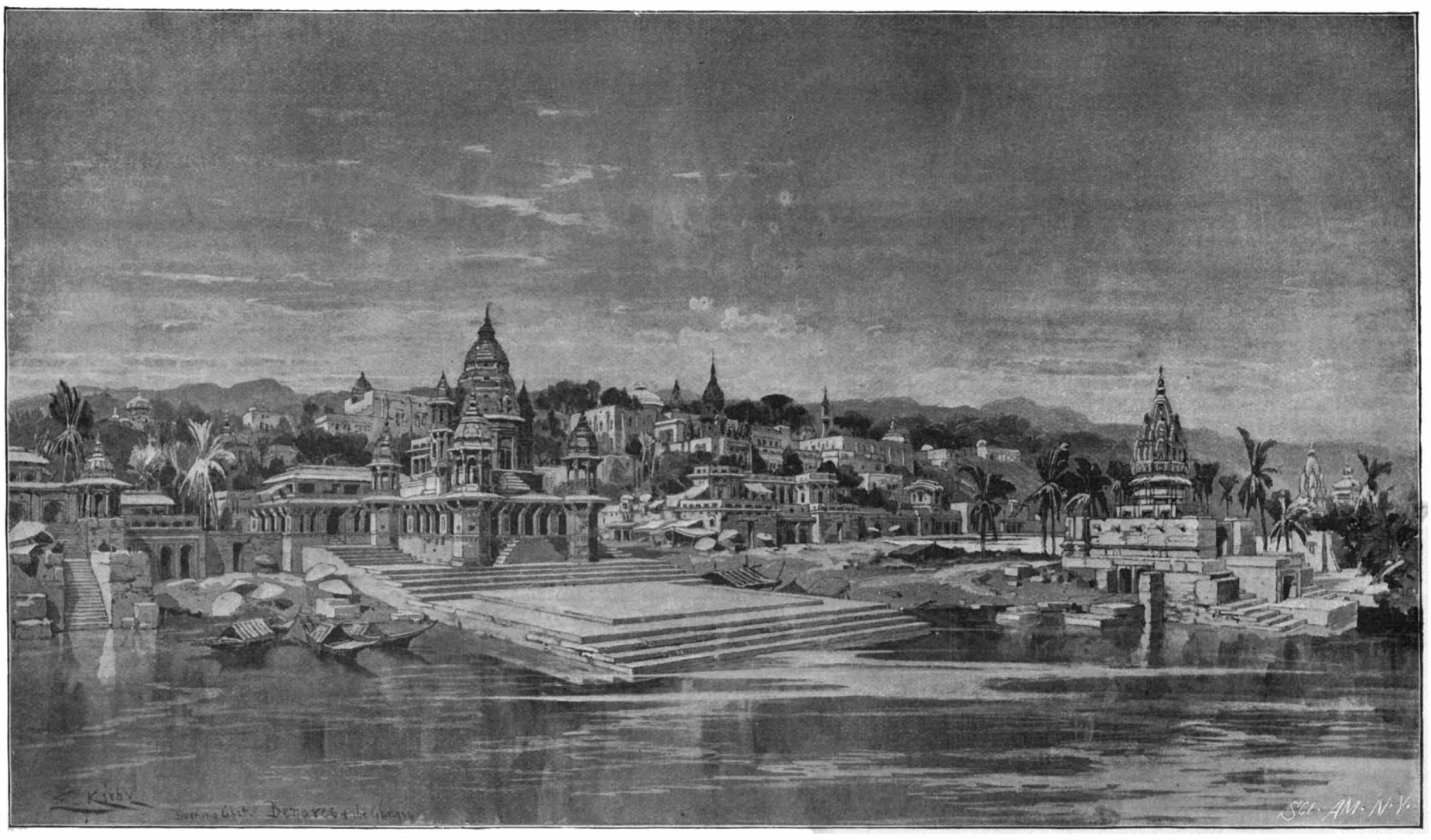
The clever manner in which the scenery is prepared may be judged by examining the engraving showing the Grand Canal at Venice, which is an exact reproduction of the original in every detail. The canal is filled with gondolas and with the gayly painted sails of the Adriatic, and the dome of St. Mark's may be seen in the background, with the graceful campanile at its left, while the center of the scene is filled with the delicate detail of the Doge's Palace. The performance is so arranged as to lead up to some stirring catastrophe. The climax is generally some awful cataclysm or some blood-curdling war scene or a great conflagration. In the Last Days of Pompeii, Vesuvius begins to belch forth flame and



CARNIVAL OF VENICE.



SIEGE OF VERA CRUZ.



BENARES, THE SACRED CITY ON THE GANGES.

FIREWORKS AS AN ADJUNCT TO DRAMATIC ENTERTAINMENT.

lava, the people struggle to escape from the falling brands and cinders, and in their haste plunge into the lake for protection, where they swim to the other shore or are rescued by those who are sailing in the vessels in the harbor. All is terror and confusion, and the noise is deafening. Sometimes there are deadly battles by land and sea. Vast bodies of troops surge backward and forward. Many are struggling in the water, which, fortunately for them, is not very deep.

Some idea of the scenes may be obtained from our engravings, which represent the Carnival of Venice, the Siege of Vera Cruz, and Benares, the Sacred City of the Ganges. Unfortunately, it is not possible to give an adequate idea of the spectacular effect of any one of these scenes when from two hundred to three hundred and fifty performers and pyrotechnists are engaged in working the gigantic affair. Among the other productions which have been, and still are in use, are the Last Days of Pompeii, Lalla Rookh, Paris from Empire to Republic, Storming of Pekin, Fall of Vicksburg, Japan and China, Moscow, Fire of London, Sardanapalus, Tel-el-Kebir, Sebastopol, Bombardment of Alexandria, and lastly Cuba, which is now being performed at Manhattan Beach.

In the SCIENTIFIC AMERICAN for July 31, 1886, will be found a full description of the actual method of working the stage scenery and obtaining the pyrotechnic effects. Of course the pyrotechnic part of the exhibition is in the hands of trained experts who travel with the entertainment. The materials are all shipped from New York.

The trolley road is now becoming a factor in the amusement business and many of the roads are catering to the entertainment of the public. Thus, a Pittsburg road gives $100,000 for the establishment of a zoological garden, and many others have tried various other more popular shows, such as the fireworks we have described, and the results so far have been very gratifying.

The Damascus of To-day.

A correspondent of the Baltimore Sun, writing from Damascus, Syria, May 1, gives the following very interesting account of this great city that was standing before Abraham's time.

While the ancient cities along the Nile are known only by the magnificence of their ruined temples, while Baalbec and Palmyra have long since passed away, while Babylon is a heap in the desert and Tyre a ruin on the shore, Damascus, which Josephus declares was standing before Abraham's time, and which is called in the prophecies of Isaiah "the head of Syria," is to-day, as it has been for thousands of years, a mighty city, influencing the customs and trade of a region of hundreds of miles around it.

Its importance in the flourishing period of the Jewish monarchy we knew from the garrisons which David placed here, and from the opposition it presented to Solomon. How close its relations continued to be with this people we infer from the chronicles of Jeroboam and Ahaz and the prophecies of Isaiah and Amos. Its mercantile greatness is indicated by Ezekiel in the remarkable words addressed to Tyre: "Damascus was thy merchant in the multitude of the wares of thy making for the multitude of all riches, in the wine of Helbon, and white wool." Alexander the Great saw its greatness, and sent Parmenio to take it while he was engaged in marching from Tarsus and Tyre. Julian the Apostate describes it as "the eye of the East." Recognized at one time as the metropolis of the Mohammedan world, its fame is mingled with the exploits of Saladin and Tamerlane. The tradition that the murder of Abel took place here is alluded to by Shakespeare (I King Henry VI, 1, 3):

> Winchester: Nay, stand thou back, I will not budge a foot:
> This be Damascus; be thou cursed, Cain,
> To slay thy brother Abel if thou wilt.

The cause of its importance as a city in all the ages is easily seen as you approach it from the south. Miles before you see the mosques of the modern city, the fountains of a copious and perennial stream spring from among the rocks and brushwood at the base of the Anti-Lebanon, creating a wide area about them, rich with prolific vegetation. These are the "streams of Lebanon," which are poetically spoken of in the songs of Solomon, and the "rivers of Damascus," which Naaman, not unnaturally, preferred to all the "waters of Israel." This stream, with its many branches, is the inestimable treasure of Damascus. While the desert is a fortification round Damascus, the river, where the habitations of men must always have been gathered, as along the Nile, is its life.

The city, which is situated in a wilderness of gardens of flowers and fruits, has rushing through its streets the limpid and refreshing current; nearly every dwelling has its fountain, and at night the lights are seen flashing on the waters that dash along from their mountain home. As you first view the city from one of the overhanging ridges, you are prepared to excuse the Mohammedans for calling it the earthly paradise. Around the marble minarets, the glittering domes, and the white buildings, shining with ivory softness, a maze of bloom and fruitage, where olive and pomegranate, orange and apricot, plum and walnut, mingle their varied tints of green, is presented to the sight, in striking contrast to the miles of barren desert over which you have just ridden.

Damascus remains the same true type of an Oriental city. Caravans come and go from Bagdad and Mecca, as of old; merchants sit and smoke over their costly bales in dim bazars; drowsy groups sip their coffee in kiosks overhanging the river; the bread boy cries aloud, "O Allah! who sustainest us, send trade;" the drink seller, as he rattles his brass cups, exclaims: "Drink and cheer thine heart," and all the brilliant costumes of the East mingle in the streets. Although Cairo contains a much larger population than Damascus, its bazars are by no means as extensive or imposing. These bazars are in long avenues, roofed over, and each is devoted to some special trade. There we find the silk, the saddler's, the tobacco, the coppersmith's, the bookseller's, the shoe and many other bazars, and now and then we come across an "antique Damascus blade" which was made last year in Germany.

While passing through the city on Friday, the great market day, I was attracted by Persians in gorgeous silks, Nubians in black and white, Greeks in their national costumes, Jews with long ringlets, Bedouins, Druses, Kurds, and Armenians mingling together, and lines of pilgrims on their way to Mecca—a marvelous medley of humanity, not to be seen, perhaps, elsewhere on the globe. The great mosque (there are over 200 smaller ones) exhibits three distinct styles of architecture, marking three epochs in the history of the place, and proclaiming the three dynasties that have successively possessed it. In the transept is a chapel said to contain the head of John the Baptist, which was found in the crypt of the church. The "street called Straight," which is interesting to all New Testament readers, is about a mile in length and runs across the city from west to east.

In round numbers the population is about 150,000, 100,000 of whom are Muslima. These are notorious for their fanaticism, which had a terrible proof in the massacre of July, 1860, when 6,000 Christians were slaughtered in the streets and 9,000 more in the district about the city. In this butchery we have a true picture of the "unspeakable" Turk when he is aroused. The churches and convents, which had been filled with the terror-stricken Christians, presented piles of corpses, and the thoroughfares were choked with the slain. Through the influence brought to bear upon the Turkish government the governor and three city officers were shot, 56 of the citizens were hanged, 117 received the death penalty, 400 were condemned to imprisonment and exile and the city was made to pay the sum of $1,000,000. Some refused at first to believe that the Turks were responsible for the massacre, but it has been shown beyond a doubt that they connived at it, they instigated it, they ordered it, they shared in it. Their conduct north of Damascus at present is a repetition of the same thing.

Besides the biblical allusions that have been made in this paper to Damascus, it will be remembered that Paul was converted on his way here, and that when the governor sought to apprehend him he was let down in a basket through a window and made good his escape, and that during his residence here "he preached Christ in the synagogue, that He is the Son of God, and confounded the Jews which dwelt at Damascus, proving that this is the very Christ." We are tempted to think that it would take more than the eloquent voice of a Paul to disturb the consummate indifference of the average pipe-smoking, coffee-drinking, sleepy-eyed citizen of modern Damascus.

Standing among the ruins of this inglorious city, you look upon the remains of two distinct but blended civilizations. The popular natural religions, which for centuries held Asia captive, mingle the wrecks of their colossal architecture with the exquisite forms that the artistic genius of Greece created. Camels, sheep, and goats graze on the grass which grows over the fallen crumbling columns and capitals, and the opening spring casts fresh green garlands over these relics of the dead past. Great columns lean heavily against tottering walls, as if determined to postpone their fall to the last moment, and over the scene of desolation the white chain of the Lebanon, capped by perpetual snow, gives a chilling look.

Here is the ancient Heliopolis of the Greeks and Romans, celebrated for its sun worship in the temple, which was one of the wonders of the world. Here you may witness how the pride and pomp of paganism arrayed itself before its death; here you see the ruin of an entire city, full of disorder, poetry, grandeur, and as you study some of this enormous debris in detail you find that nowhere is the Corinthian acanthus carved with more delicacy than on these gigantic blocks.

The temples of Baalbec, dating at least from the reign of Antonius Pius, were erected on the acropolis of the city, which was placed on an eminence, surrounded with gigantic walls, the stones of which belonged to that Phœnician architecture which has earned the name of Cyclopean.

First, there was the Great Temple of Jupiter, which has preserved a large part of its portico, its ornate architrave, its fluted columns, and a rich profusion of decoration; then there was the Temple of the Sun, the ruins of which clearly indicate its past grandeur, and the last was what was known as the Circular Temple, the only remains of which are a few highly decorated chapels. Passing through a long passageway, we enter a court, 70 yards long by about 85 wide, which is in the form of a hexagon, with here and there rectangular recesses in the wall, each with columns in front. From this hexagon originally a handsome portal led into the great court, about 150 yards long by 125 wide, in the center of which stood the basilica, while around were rectangular recesses, called by the Romans exedrae.

In front of this great court the principal temple of Baalbec stood. This temple had columns running round it, only six of which are now standing. These are 60 feet in height, with Corinthian capitals and bordered with a frieze. When the temple was in its glory there were 17 columns on either side of the temple and 10 at either end, 54 in all, the building inclosed by them being 290 feet long by 160 feet broad. The masses of broken columns and falling walls indicate not only the work of the "tooth of time," but the ruthless ravages of the Arabs, who have destroyed priceless treasures in art in order that they might secure the iron clamps in the columns. In the grand portico of the temple there is an inscription, which may be translated as follows: "To the great gods of Heliopolis. For the safety of the Lord Ant. Pius Aug. and of Julia Aug., the mother of our Lord of the Castra (here it is quite indistinct) Senate. A devoted (subject) of the sovereigns (caused) the capitals of the columns of Antoninus, whist in the air, (to be) embossed with gold at her own expense."

The second temple, or Temple of the Sun, stands on a platform lower than that of the Great Temple; 19 out of the 46 columns, each 65 feet high, remain, and the capitals and entablatures of the columns and the friezes round them are as exquisitely executed as anything in Baalbec. The portal of the temple claims one's special attention. The door posts are monoliths, most richly ornamented with foliage and genii; the architrave is of three stones, on the lower side of which is the figure of an eagle, the emblem of the sun, and the basement, which is 100 by 70 feet, is ornamented most profusely. Built into the outer wall are three stones, the largest ever used in architecture. The temple was at one time called Trilithon, or three stoned, probably from these stupendous blocks. One stone measures 64 feet long, another 63 feet 8 inches, and a third 63. Each is 13 feet high and 13 feet thick, and placed in the wall at a height of 20 feet above ground. It is still an unsolved problem how they were ever raised to their present position.

At the quarries in the Lebanon Mountains, where doubtless these stones came from, I examined an unfinished block which is 71 feet long and nearly 18 feet in thickness. The Circular Temple, which is located near to the modern village, is surrounded by Corinthian columns, is richly adorned by a frieze of flowers, and the entablature is heavily laden with elaborate decoration. As I sat upon an ornately sculptured parapet and, quietly and alone, studied this wilderness of magnificent ruins, where were displayed Phœnician glory and power, the poetry of Grecian art, and the pomp of Roman pride, the transitory character of even the most permanent and glorious of the material was pictured before me as never before.

The Chicago Academy of Sciences.

The Chicago Academy of Sciences is now in its thirty-ninth year of existence, and occupies a handsome fireproof structure in one of Chicago's most beautiful parks. Its museum contains about 50,000 specimens illustrating American natural history, and its library contains 7,000 works of reference in over a dozen different languages.

A free course of lectures by twenty-five professors will be given for four hours daily from the 15th of July to the 15th of August. The several subjects are: Anatomy, climatology, optics, geology, astronomy, physics of electricity, botany, zoology, entomology, comparative anatomy, mental science, biology, physiology, malacology, physical geography, surgical anatomy, physics of optics, bacteriology, ornithology, scientific nursing, language, Latin, German, anthropology, chemistry, surgical philosophy, medical chemistry, and hygiene and meteorology. Meteorology will be demonstrated at the auditorium tower every Saturday afternoon, from 2 to 4 o'clock, by Prof. E. B. Garriott. Those who are interested in such a course should address Dean J. J. Tobias, 115 Dearborn Street, Chicago.

AN International Congress of Hydrology, Climatology and Geology will be held at Clermont Ferrand, France, from September 28 to October 6. The minister of the interior of the republic has accepted the honorary presidency, and the government of the United States has been invited to appoint delegates.

Science Notes.

The University of Utrecht celebrated the twenty-sixth anniversary of its foundation on June 22 and the five following days.

A case of complete and immediate relief from the effects of ivy poisoning is reported in the Medical World by Dr. W. L. Shanks. His patient was swollen from head to foot, but in an hour after bathing in a solution of sodium hyposulphite was attending to business as if nothing had happened.

Science states that the extended use of small pilot balloons would result in giving us much valuable information as to the air currents in and around clouds. These balloons, which are cheap, reach considerable altitudes and are especially useful in indicating the drift of the air currents when there are no clouds in the sky, the direction of the lower currents when only the upper currents are visible, etc.

Observations made by M. Perrotin on Mount Mounier, at an elevation of about nine thousand feet above the sea, have convinced him that the period of the rotation of the planet Venus is equal to that of her revolution round the sun, the time of both being two hundred and twenty-five days or less. The observations were carried out in December of last year and in February, 1896.

Shillington (Montreal Medical Journal) reports the case of a man thirty years of age who was exposed to illuminating gas for about ten hours, and at the time he was found was profoundly asphyxiated. Artificial respiration, strychnine and the faradic brush were employed, which caused temporary improvement; but, the condition becoming worse, oxygen was employed, with immediate and slow improvement in all symptoms. In all about fifteen gallons were used in the course of eight hours. The reporters are firmly convinced that if this remedy had not been used, their patient would have died.

An account is given in the Physical Review by R. A. Millikan of some careful tests of light emitted by glowing solids and liquids, with a view to discover the laws of its polarization. This phenomenon is exhibited strongly by incandescent platinum, silver, gold, and by molten iron and bronze; a somewhat feebler polarization is shown by copper, brass, lead, zinc, and solid iron. The most significant result named is that polarization is minimum with rays emitted normally to the surface and maximum at a grazing emission, thus indicating that the vibrations take place in a plane at right angles to the emitting surface. Glass and porcelain also emit polarized light, but to a lesser amount; fluorescent bodies do the same, so that evidently a high temperature is not necessary; and in the case of uranium glass it is said to be the green reflected light which is polarized, and not the blue incident light diffused from the surface.

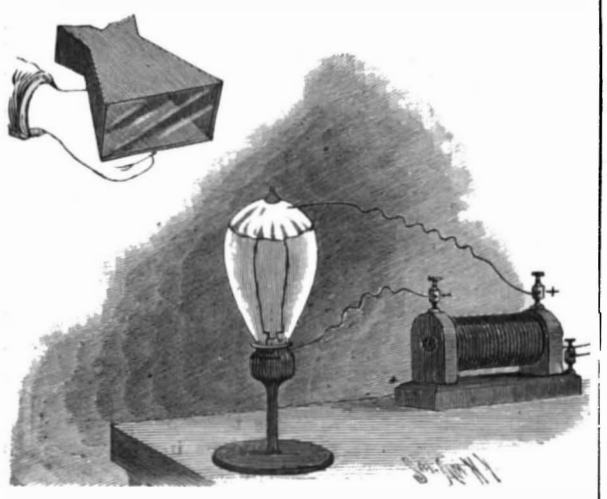
The first of the two annual conversaziones of the Royal Society was held on May 6, says Science. The exhibits included X ray photographs by Messrs. Swinton, Jackson and Sydney Rowland. Mr. F. E. Ives exhibited his method of color photography and Prof. Mendola gave a demonstration by means of the electric lantern of Prof. Lippmann's color photographs by the inferential method. Prof. Worthington showed photographs of the splashes produced by a falling drop of water taken with the electric spark, the exposure being less than three millionths of a second. A method was shown by which two or three thousand copies of a photograph can be printed, developed and fixed in an hour. The exhibits seem to have been largely in photography, but in addition Prof. Dewar repeated his experiments with liquid air, and the new binocular field glasses and stereo-telescopes of Mr. Carl Zeiss were exhibited.

Novak and Sulc have examined nearly 300 substances on the absorption of the Roentgen rays by chemical compounds. Their method of investigation consisted in attaching rings of glass to a sheet of paper and placing uniform layers of the finely pulverized materials in the different rings, so that the thickness of the layer was 0·4 cm. in each case. The paper with the rings was then placed over a photographic plate which was enveloped in black paper, and exposed to the Roentgen rays for a period of 20 to 25 minutes. By comparing the photographic effect of the rays where the substances were interposed, the relative absorptions were determined. The authors found, says the American Journal of Science, that a great number of organic compounds containing only carbon, hydrogen, oxygen and nitrogen are equably penetrable, and hence they conclude that the absorption has no relation to molecular weight or the arrangement of the atoms. Organic halogen derivatives were found to possess much greater absorption, which increased with the number of halogen atoms present. This effect increased with the atomic weights of the halogens, two atoms of bromine having a greater effect than six chlorine atoms, while iodine derivatives were entirely impenetrable under the conditions used in the experiments. This indication of the influence of elements of varying atomic weight led the authors to examine a series of elementary substances, all of rather low atomic weights.

INEXPENSIVE X RAY APPARATUS.

The expense of special Crookes tubes, powerful coils, and batteries has deterred many from entering this interesting field of experiment; but Mr. R. McNeil, of this city, has recently devised apparatus in which an ordinary incandescent lamp is substituted for the Crookes tube, and an induction coil of common form is made to supply electricity of sufficiently high potential to produce the X ray phenomena.

The lamp, which is a 52 volt, 16 candle power Sawyer-Man lamp, is made of German or lime glass. For convenience, it is mounted in an insulating standard. The top of the lamp is covered with aluminum



X RAY EXPERIMENT SIMPLIFIED.

foil, which is connected with one terminal of the secondary of the induction coil, and the bottom is connected with the other terminal of the secondary, as shown. The X ray proceeds from the cathode. By means of the fluoroscope the shadows of the bones of the hands and feet, also of the limbs, may be seen, when they are placed between the instrument and the lamp.

It has been found in this experiment that when a blue fog appears in the lamp, the vacuum is too low for the best results. By placing the lamp in the house circuit for fifteen or thirty minutes the high vacuum is restored by the heat and will remain good for about fifteen minutes.

The coil is capable of giving a three inch spark, and the X ray produced by this simple and inexpensive apparatus is sufficient for making radiographs.

THE DANCERS.

We present an illustration of one of the toys of the year. It consists of a nickel plated box some three inches in diameter. In the center of the top projects the end of a spindle, and at one side is a lever. To operate the toy this side projecting piece is pulled out,

THE DANCERS.

and one of the triangular pieces of tin to which paper figures are attached is placed in contact with the spindle in the top of the box. The dancers then begin a lively waltz on the top of the box. The secret of operation is not at first apparent, though it is evident that magnetism has something to do with it. On opening the box the mystery is solved. The spindle is of magnetized steel and extends through the top of the box, forming a slight projection. It turns freely and carries a pinion and a metal disk. The pinion is actuated by the projecting side piece through the medium of a toothed sector. Motion is transmitted to the triangular piece of tin carrying the dancers by the magnetized spindle causing a horizontal movement, giving it a movement around its own axis. Curved wires and a spiral, one side of which is colored, are also provided, and they all move around the pin at a lively rate, producing novel effects.

A Homeric Fight at Sea.

We were cruising in the Strait of Malacca, between the Nicobars and the Malay Peninsula, and had succeeded in killing a full-sized sperm whale. He had been a tough customer, needing all our energies to cope with him; but a well-directed bomb closed the negotiations just before sunset. As usual, he had ejected the contents of his stomach before dying, and we specially noticed the immense size of some of the masses floating about. By common consent they were about as large as our hatch-house, which measured 6×6×8 feet. I must very distinctly state that these masses were not square, but irregularly shaped masses, bitten or torn off in blocks from the body of some gigantic squid.

The whale was secured alongside, and all hands sent below for a good rest prior to commencing to "cut it" at daybreak. I had the watch from eight bells to midnight, and at about 11 P. M. was leaning over the lee rail, idly gazing seaward, where the rising moon was making a broad lane of silvery light upon the smooth, dark waters. Presently there was a commotion in the sea, right in the way of the moon, and I immediately went for the night glasses to ascertain, if possible, the nature of it. In that neighborhood there are several active volcanoes, and at first I judged the present disturbance to be one of these, sending up debris from the sea bed. A very short examination satisfied me that the trouble, whatever it might be, was not of volcanic or seismic origin. I called the captain, as in duty bound, but he was indisposed to turn out for anything short of actual danger; so the watch and I had the sight to ourselves. We edged away a little under the light draught of wind, so as to draw nearer to the scene, and presently were able to realize its full significance. A very large sperm whale was engaged in deadly conflict with a monstrous squid, whose far-reaching tentacles enveloped the whale's whole body.

The livid whiteness of those writhing arms, which enlaced the cachelot like a nest of mighty serpents, stood out in bold relief against the black bowlderlike head of the aggressor. Presently the whale raised itself half out of the water, and we plainly saw the awful-looking head of the gigantic mollusk. At our distance, something under a mile, it appeared about the size of one of our largest oil casks, which held 336 gallons. Like the rest of the calmar visible, it was of a peculiar dead white, and in it gleamed two eyes of inky blackness, about a foot in diameter.

To describe the wonderful contortions of those two monsters, locked in a deadly embrace, is far beyond my powers, but it was a never-to-be-forgotten sight. The utter absence of all sound, for we were not near enough to hear the turmoil of the troubled sea, was not the least remarkable feature of this Titanic encounter. All around the combatants, too, were either smaller whales or immense sharks, who were evidently assisting in the destruction of the great squid, and getting a full share of the feast. As we looked spellbound we saw the writhings gradually cease and the encircling tentacles gradually slip off the whale's body, which seemed to float unusually high. At last all was over, and the whole commotion had completely subsided, leaving no trace behind but an intensely strong odor as of a rocky coast at low tide in the full blaze of the sun. Since that night I have never had a doubt either as to the origin of all sea serpent stories or the authenticity of the old Norse legends of the kraken; for who could blame a seaman witnessing such a sight, and all unaccustomed to the close observation of whales, for reporting some fearsome monster with horrent mane and floating "many a rood"?—Nature.

IT is well known that the bones are relatively opaque to the X rays, and that this opacity is due to the chemical composition of the fundamental bony tissues, which are made up of calcium salts (phosphates, carbonates, and fluorides). The question would then be a natural one, whether, by introducing a salt of lime into the veins, they could be made to leave a shadow on the photographic plate. The Physical Institute at Rome has performed this experiment. Into the brachial artery of a dead body was injected a paste of sulphate of lime, sufficiently liquid to penetrate all the blood vessels, and then, after it had hardened, the hand was photographed, the Crookes tube being held at a great distance, so that the shadows would be very sharp.—Cosmos, Paris.

AN American firm has obtained a concession to build a railroad between Seoul and Chemulpo, in Corea, a distance of 30 miles.

Sauces for Tobacco.

Nearly all tobaccos are treated with sauces before being made up into their commercial form, says the Boston Evening Transcript. By this means they are flavored in various ways, so as to adapt them to the tastes of consumers. The tastes of consumers vary in different localities, and to make his goods to suit is the business of the manufacturer. Each manufacturer has his own secret receipts, which are handed down from father to son. Tastes differ, even among people of various occupations. Miners, for instance, want a very strong tobacco, with a scent and flavor which another class would not relish. Outdoor workers in general like a stronger tobacco for smoking and chewing than indoor folks.

Nearly all tobaccos, in fact, are doctored. Sometimes it is done in an illegitimate way, for the purpose of deception. Ordinarily, however, it is honest and even necessary. One object of it is to make the tobacco keep better. Without such treatment it would become so much dry leaves, the aromatic properties passing off. Niter is added to smoking tobacco in order to make it burn well. The leaves intended for chewing are steeped in licorice or other gum, in order that the plug shall have the requisite consistency and sweetness. Mucilaginous substances in small quantities are added to cigarette tobacco, so that the particles may hold together and not fall out of the paper wrapper. Some pipe tobaccos are heavily charged with perfumes by treating them with essential oils of rose, verbena, citronelle, bergamot, cassia, musk, and catechu.

It is not true that cigarettes are commonly charged with opium and other injurious drugs. However, they are flavored with essences of various plants, such as vanilla, cascarilla, stramonium, coffee, valerian, and tea. Occasionally a few tea leaves are mixed with the tobacco. These flavors are matters of fancy, and women particularly select their cigarettes with reference to them. Scarcely a plant that will yield an agreeable flavoring escapes employment by the manufacturers of tobacco. Among those most used are the lemon, the orange, geranium, sassafras, thyme, anise, mint, and cinnamon. Honey and maple sugar are utilized for sweetening. A decoction of hay is sometimes applied to smoking tobacco.

The basis of a "sauce" is nearly always some spirituous liquor—usually rum. Sometimes wine is used. Glycerine is a common ingredient. More or less molasses enters into the composition of much plug tobacco. The rum preserves the tobacco, and adds to the flavor of the plug. The plug trade for the United States navy is large, and it is required by the government that the tobacco furnished in this shape for the use of its sailors shall contain no foreign substances, except a limited percentage of licorice. The tobacco leaves are dipped into the sauce or else sprinkled with it.

Death of Niagara Falls.

Fifteen hundred years ago the terrestrial movements raised the Johnson barrier to the Erie basin so high that the waters of that lake reached not merely the level of Lake Michigan, but the point of turning all the water of the upper lakes into the Mississippi drainage by way of Chicago. But the falls were then cutting through the ridge, and when this was accomplished, before the change of drainage was completed, the surface of Lake Erie was suddenly lowered by many feet, and thus the falls were re-established for some time longer.

Slowly, year by year, one sees the cataract wearing back and suggesting the time when the river will be turned into a series of rapids; but another silent cause is at work, and one not easily seen—namely, the effects of the changing of level of the earth's crust. From the computations already referred to it was found that for the first twenty-four thousand years of the life of the river only the Erie waters flowed by way of the Niagara River, and for only eight thousand years have all the waters of the upper lakes been feeding the falls. If the terrestrial movements continue as at present, and there appears no reason to doubt it, for the continent was formerly vastly higher than now, then in about five thousand years the rim of the Erie basin promises to be raised so high that all the waters of the upper lakes will flow out by way of the Chicago Canal. Thus the duration of Niagara Falls will have continued about thirty-seven thousand years. But the lakes will endure beyond the calculations of the boldest horologist.—Appleton's Popular Science Monthly.

Underground Temperatures.

The question of the rate of increase in temperature from the surface of the earth downward has long been one on which prominent authorities differ, and no law on the increase of temperature expressed in arithmetical progression has ever been found applicable in a universal sense.

Among the scientists who have recently given this subject considerable thought is M. Joseph Libert, who records observations made at Produits colliery, Flenu, Belgium. These observations, owing to the depth of the shaft, have been carried to a depth of 3,772 feet. Taking 82 feet as the depth at which atmospheric variations of temperature cease to have any influence, it was calculated that the rate of increase of temperature given by the tests at Flenu was 1° Fah. for 53·97 feet of vertical depth. This result agrees closely with that obtained some years ago by M. Cornet in the same district, his rate of increase being 1° Fah. for 54 feet, only, however, for depths up to 1,679 feet.

Prof. Prestwich's mean, derived from English and Belgian mines, was 1° Fah. for 49·5 feet. M. Libert does not, however, think that the law of increase of temperature can be correctly expressed as arithmetical progression, but that the rate of increase is greater at greater depths. Taking the results obtained at Flenu with those obtained at the Grand-Buisson colliery in the same field, he concludes that the rate of increase down to depths of 2,263 feet is 1° Fah. for 65 or 69 feet, while for depths from 2,263 feet down to 3,772 feet it is 1° Fah. for 43 feet.

At a bore hole sunk by the Wheeling Development Company, at Wheeling, W. Va., which was 4,500′ deep and 4⅞″ in diameter, and which was cased to the depth of 1,570, the strata in nearly as normal condition as possible, and dipping only 50′ to the mile, the following results were shown:

The increase of temperature between points 1,350′ from the top and 2,236′ from the top, which is very nearly M. Libert's intermediate distance, was about 1° per 100′. From a point 2,236′ from the top to a point 3,730′ from the top the increase in temperature was about $1\frac{3}{10}$° per 100′. From a point 3,730′ from the top to the lowest point at which observations were taken, 4,462′, the increase was at the rate of $1\frac{7}{10}$° per 100′. In other words, from a point 135′ deep to a point 2,336′ deep the increase of temperature was about 1° for 100′; from a point 2,236′ to a point 3,730′ deep the increase was at the rate of 1° for each 77′ in depth; and from the point 3,730′ deep to the point 4,462′ deep the increase was at the rate of 1° for each 58′ in depth. The average increase in temperature from the point 1,350′ feet from the surface to the point 4,462′ from the surface was at the rate of about 1° for each 75′ in depth. The average rate of increase of temperature at the Sperenburg bore hole, near Berlin, which is 4,170′ deep, was at the rate of 1° for each 60′ in depth. At the bore hole of Schladabach, near Leipsic, which is 5,740′ deep, it is at the rate of 1° for each 68′ in depth. A comparison of the results found at these different bore holes makes evident the fact that no positive rule for increase of temperature with depth can be adopted.—Colliery Engineer.

Collecting Bird Skins.

B. H. Warren, State Zoologist of Pennsylvania, tells in Bulletin No. 6 how to collect, skin, preserve, and mount birds. The collector having, of course, a permit granted by the State in which he lives, starts out after his birds with the best shotgun he can procure. Usually it is a 12 gage, but a 16 or 20 bore is preferable, and he should have shells loaded with shot of a size for anything from a warbler to an eagle. An auxiliary barrel that will shoot a 32 or 38 caliber shot shell is also useful, and a metal tube five or six inches long to fit into the gun barrel the same as a cartridge, loaded with 22 caliber shot shells, is also useful for small birds like the warblers. Smokeless powder is best for the 32, 38, and 22 caliber shells, because it makes little noise to disturb the other birds in the vicinity.

To carry the specimens a good sized fish basket is best, each specimen being wrapped in paper carefully, and great care being taken that the tail feathers are not broken. When several large birds are taken it is best to skin but the body, leaving the wings, legs, and head whole. Of course, under such circumstances, facts about the bird are jotted down in the note book. The note book should be kept in ink, because a pencil mark blurs easily. When a bird is shot, it should be picked up by the legs or bill, unless it is a crippled heron, hawk, or owl. The wounded birds are killed by pressing the heart from either side close to the wings. All wounds and openings are stopped with cotton to prevent the plumage being soiled.

To be of value, each specimen should be labeled with the name, sex, date, and locality, especially in the case of young birds, since an adult can always be identified. The name of the collector, color of the bird's eyes, and contents of its stomach may also be put on the label, besides abbreviations indicating adult (ad.), or immature (g. or yuv.), and the state of plumage, whether nuptial (nupt.) or migratory. "Hornot" means a yearling bird.

The average collector, man or woman, who from a love of nature seeks the fields, will not care to do more than skin the birds, leaving it to some regular taxidermist to mount them. For skinning birds and blowing eggs six instruments are needed, namely, a pair of spring forceps, an egg drill, a cartridge knife, a pair of surgical scissors, a pair of stuffing forceps, and a blowpipe to blow the eggs. Any taxidermist will show how to skin a bird far better than words can describe the process. Once secured, the bird skin is preserved with common salt, if at a distance from the taxidermist, as in a camp, for instance.

The eggs are blown through a single hole in the side, not through the hole in each end, after the usual style with hen's eggs. A small circular hole is drilled through the shell, a small wire is inserted to break up the contents, then the blowpipe is inserted, and, with the hole down, a gentle, steady blowing insures the cleansing of the egg.

A New Illuminant.

M. Henry is a French savant of the school of higher studies, who has revealed the power of sulphate of zinc to absorb sunlight and give it back in the dark. Poudre de riz made with this mineral gives a soft luminosity to a fair young face. A lady cyclist dusted all over with this powder is in herself a lamp on a pitch dark night. The luminous pigment is not liable to be spoiled by damp, by carbolic acid or by any weak acid. It resists rain if united to some strongly adhesive body. There is a house in the Rue de Longchamps where a windowless set of rooms is lighted with it. The lady of the house receives there her friends at "five o'clocks." The apartment seemed bathed in moonlight, the curtains are as if studded with glowworms, the ceiling scintillates. The furniture looks as if rubbed with phosphorus. The play of this light on colored objects gives one the impression of Aladdin's underground palace. Often they take the rich, glowing tones of the topaz, ruby and emerald. This powder does not lose its brilliancy if used in starch or size. A black dress trimmed with lace made luminous by it is more than bewitching.

Secondary Battery Plates.

W. J. S. Barber Starkey sends the following interesting note on secondary battery plates to the English Electrical Review:

"I venture to send you a little experience in case it might possibly be of any interest. Last year, when a set of storage cells was being made, the pasted plates, after being dried, were, by mistake, immersed for several hours to harden in a weak solution of sulphuric acid, in which a small quantity of red chromic acid powder had been dissolved. I supposed that the plates would be ruined, but to my surprise they sat harder and more quickly than if they had been immersed in ordinary dilute sulphuric acid, and the plates apparently became deeply peroxidized and assumed a dark brown color. I have since been told that this result would undoubtedly take place. The plates thus treated were then set up in the usual way in the ordinary dilute sulphuric acid battery solution, and are in every way most satisfactory after having been in regular use for some time; you will know whether it is a fact that the red lead in a lead grid turns into peroxide if immersed in a solution of chromic acid."

Harvard's Meteorological Stations.

Eight Peruvian meteorological stations are maintained by the Harvard College Observatory. The principal one is at Arequipa, 8,050 feet above the sea and 80 miles from the coast. At Mollendo, on the coast, is another 85 feet above sea level; between Mollendo and Arequipa is another station, La Joya, placed in the center of a rainless, barren district, and 4,140 feet above the sea. The most interesting station is on the summit of the volcano El Misti, 19,200 feet above sea level, and about 10 miles northeast of Arequipa. This is now the highest meteorological station in the world; it is equipped with a meteorograph, devised by Mr. S. P. Fergusson, of the Blue Hill Observatory, Mass., which automatically records temperature, pressure, humidity and wind direction and velocity, and only requires winding once in three months. This obviates the frequent visits from Arequipa once necessary. The other stations are on flank of El Misti, 15,700 feet; at Alto de los Huesos, 13,400 feet; Cuzco, between the Eastern and Western Andes, 16,100 feet; and Santa Ana, east of the Andes, and 3,400 feet above sea level.

Langley's Bolometer.

Professor Langley's remarkable instrument known as the bolometer, occupying the entire building of the astro physical observatory attached to the Smithsonian Institution, is pronounced by Rene Bache the most delicate mechanical contrivance ever devised, inasmuch as its "senses" are more acute than those of any human being. Outside of the building a huge machine, the inside works of which are a clockwork mechanism, pumps sunshine through a long tube into a dark room where the bright ray passes through a prism; the latter is not of glass, because glass is opaque to the invisible rays of the solar spectrum, but is of rock salt, carefully cut to a certain angle by the famous optician Brashear, and, though the prism looks almost opaque to the eye, it is as crystal to the invisible rays above the violet and below the red. Thus the operator is able to follow the invisible rays along their dark path, their presence and potency being accurately registered, having for its most essential part a balance composed of a thread of spun glass and a tiny mirror, the latter attached to a piece of a dragon fly's wing.

RECENTLY PATENTED INVENTIONS.

Mechanical.

WATER ELEVATOR.—Joseph McMurrin, Shoshone, Ida. The object of the invention is to provide a new and improved water elevator or centrifugal pump, which is simple and durable in construction, very effective in operation, and arranged to elevate the water to any desired height. The invention consists of two or more pipes or cylinders, located one within the other, and adapted to revolve in opposite directions, the pipes being provided with spiral blades.

SAW GUIDE.—Wrenny Peake and Edward C. Inderlied, Rock Rift, N. Y. This invention relates to a guide for a cross-cut saw adapted to be operated by a single person in sawing a log, and the object is to provide a simple device adapted to engage and exert a downward pressure on the saw at the side of the log opposite that at which the sawyer stands. In brief, the invention consists of a saw guide, comprising an anchor plate adapted to be secured to a log, an arm curved upward between its ends and having pivotal connection with the anchor plate, and guide fingers on the free end of said arm.

Miscellaneous.

TREMOLO ATTACHMENT FOR STRINGED MUSICAL INSTRUMENTS.—Clarence Elwood Pryor, New York, N. Y. The object of the invention is to provide a new and improved tremolo autoharp attachment for pianos and other stringed musical instruments which is simple and durable in construction, very effective in operation, entirely independent of the hammers or other parts of the action, and arranged to enable the player to readily throw it out of action and vary the tremolo effect, as desired. It consists of a tremolo attachment for stringed musical instruments, comprising an eccentrically mounted drum under the control of the performer, a netting attached to the said drum, and bodies suspended from the said netting, and adapted to move in and out of contact with the piano strings.

SUNSHADE FOR BICYCLES.—George A. Conklin, Blairstown, Iowa. This invention relates to certain improvements in that class of sunshades or parasols which are especially designed for use on bicycles and similar vehicles, and the object of the invention is to provide a device of this character of a simple and inexpensive construction which shall be adapted to be folded compactly and which shall be at once light and strong and capable of convenient application and adjustment to secure it in place. The invention consists in a sleeve having means for securing it in place to the frame or handle bar of the bicycle or equivalent vehicle, a folding parasol having a stem slidable in said sleeve and spring retainers arranged on said stem and adapted to engage apertures in said sleeve to hold the parasol in an elevated or lowered position.

WINDOW CLEANING CHAIR.—Henry G. Wilmerling, Brooklyn, N. Y. The invention relates to an improvement in window cleaning chairs, and the object of the invention is to provide a chair of exceedingly simple and durable construction and capable of being expeditiously and conveniently applied to a window frame and sill in such manner that the chair will be held firmly and securely in position, and furthermore to so construct the chair that it may be adjusted to window sills of different widths. In brief, the invention consists of a base bar terminating at one end in a bracket adapted for engagement with the inner sill of a window, a seat having sliding movement on the said bar and provided with a standard at its inner end attached to its bottom and having a foot bar for engagement with the outer sill of a window, an arm extended outward from the foot bar, a slide on said arm for the base bar and a lock lever carried by the sear and adapted for engagement with the said base bar.

TROUSERS STRETCHER.—William J. McCoy, Santa Barbara, Cal. The invention relates to an improved device for stretching the legs of trousers to remove wrinkles in the cloth and preserve correct form of the garment, and has for its object to provide a novel, simple and inexpensive device which will be adapted for a convenient application, and that in pairs will, when in position, produce a crease at the front and rear faces of the legs of trousers to which the duplicate stretchers are applied and remove wrinkles from other portions of the same. In brief, the invention consists in a trousers stretcher, of the combination with two stretcher bars longitudinally slotted between their ends, of a connecting link consisting of two plates having their ends projected into the slots and pivoted to the bars, one of said plates being provided with slot openings and the other provided with projections to engage in the slots, whereby the two plates will be held in parallelism when adjusted.

BICYCLE SUPPORT.—Stuart A. Brown, Hubbardston, Mass. The object of the invention is to provide a new and improved bicycle support which is simple and durable in construction and arranged to enable the rider to quickly bring the support in action, to hold the wheel in an upright position on the road or other place. The invention consists principally of a pair of legs mounted to swing transversely on the sides of the bicycle frame, said legs being normally folded up against the sides of the frame and adapted to swing downward to engage their free ends with the ground on opposite sides of the frame.

SAFETY POCKET.—Charlotte Melisse Johnson, Charleston, W. Va. The object of the invention is to provide a pocket for garments of all kinds which will prevent the accidental loss of articles contained therein by dropping out when stooping down or by having the pockets picked, and it consists in a pocket having transversely arranged about its body portion a constricting band of elastic materially arranged upon the exterior of the pocket and held in place by retaining keepers, which, while preventing the band from coming off altogether, will nevertheless allow it to adjust its lf along the body of the pocket, according to the volume of contents of the pocket.

HARNESS SADDLE.—Otto F. Seyfarth, New York City. The invention relates to improvements in harness saddles, and the object is to provide a harness saddle particularly adapted to soreback horses. It consists of a harness saddle, comprising saddle pads, a metal tree having slotted ends, metal plates secured to the inner side of the pads and having slot openings registering with slots through the pads, clip plates removably secured to the pads, and having hook portions adapted to pass through the several slot openings, and having slot openings through which straps may pass, terrets detachably secured to the tree, and a check hook removably secured to the tree.

KEYED CITHERN.—Louis K. Dathan, Brooklyn, N. Y. The invention relates to citherns and the like, and its object is to provide a new and improved musical instrument arranged for the performer to manipulate a keyboard in order to pick the desired strings in such a manner that any desired forte or pianissimo is produced. The invention consists principally of a keyboard provided with keys capable of independent movement toward and from the strings, but connected to move sidewise in unison, and each carrying a picker adapted to engage the corresponding string with more or less force, according to the position of the keys and their pickers relatively to the strings.

NEWSPAPER ADVERTISING INDEX.—George W. Leesnitzer, Washington, D. C. The advertising index is designed for the use of newspapers. This device is based upon an economic idea, which, it is claimed, will greatly enhance the value of advertising goods and wares. It consists of a classification of the items offered by the different advertisers. These items are grouped under their proper headings in the columns, and the whole is provided with an index. In the crowded advertising columns of any large journal the reader, under this plan, can as readily refer to any item as he could to a word in the dictionary. It also practically dispenses with the use of display headlines, thus effecting, in many instances, a large saving to the advertiser.

SAFETY ENVELOPE.—Mary Clarke, New York City. This invention relates to certain improvements in safety envelopes, such as are especially designed for mailing purposes, and the object of the invention is to provide an envelope of a simple and inexpensive character which shall be adapted to effectually guard against tampering with letters, etc., the envelope being so constructed as to indicate at once whether it has been tampered with. It consists of an envelope having end flaps—a bottom flap and a sealing flap—said end flaps and bottom flap being secured together and the bottom flap being provided wirh a slit, the sealing flap being formed at its central portion with cuts extending inward from its edges, whereby a tongue is formed at the central portion thereof, said tongue having its end even with the edge of the sealing flap and having at its opposite sides rearwardly projecting locking ears, the edges of the sealing flap on opposite sides of said central tongue being gummed and adapted to be sealed down on the bottom flap, and said tongue being adapted, when the sealing flap is closed, to pass through the slit in the bottom flap to bring said ears into engagement with the edges of the said slit.

SAFE ATTACHMENT.—Abraham Obern-dorf, Jr., Centralia, Kan. The object of the invention is to provide a device, in the nature of a portable attachment, which, when placed in a safe, vault, or strong room, will, in the event of an attempt by burglars to blow open the same, cause the generation of a stifling and poisonous gas which will make it impossible for the burglar to live in the atmosphere of the same, and thus preclude him from making away with the booty. The invention consists in the construction and arrangement of such portable device, which may be hung up or detachably fixed in any safe or vault already in use, and without regard to the construction of the same, and which device serves to utilize the concussion to set off or release a trigger and hammer mechanism that in turn breaks the bottle, or bottles, or tubes, containing the reagents from which the deadly gas is evolved.

VENETIAN BLIND ROLLER SUPPORT.—Charles L. Miller, New York. In the ordinary method of hanging Venetian blind rollers, the said rollers are unsupported intermediate of their ends, and it is found that when long rollers are employed they will sag at the middle, and thus prevent an easy action of the same and also cause the slats of the blind to curve at the center. The object of the invention is to prevent these difficulties or objections; and, broadly stated, the invention consists in an intermediate hanger or support for a Venetian blind roller. In brief, it comprises a roller for a Venetian blind, made in sections, and a hanger plate having a pivotal connection with a portion extended between the adjacent ends of said roller sections, and having a fastening device at its upper end adapted to be engaged with a device secured to a window casing.

TROUSERS GUARD FOR BICYCLE RIDERS.—Robert Severs Bowman, Berwick, Pa. The improved guard, or clasp, is designed and adapted to clamp the slack fold of the trousers leg and hold it drawn smoothly without wrinkling or destroying the "crease" formed in the front portion of the same. The guard is constructed of a circular body portion for embracing the leg of the user, and a clasp or clamp proper for receiving and holding the fold of the trousers leg.

AXLE.—John R. Henry, Homer City, Pa. The invention relates to certain improvements in axles, and has for its object to provide in part an axle of a convenient and inexpensive construction adapted to be manufactured without requiring the axletree to be forged, which shall at the same time be at once simple and of sufficient strength, and in part to provide an axle having means for conveniently and securely attaching thereto the hub of the wheel. The invention consists in an axle having an axletree of bar iron, such, for example, as is common in the market, said axletree having metallic sleeves secured to its ends and adapted to receive the wheel hubs, the said hubs and sleeves being secured together by a simple attaching device.

HALTER.—Charles H. Allen and Harry C. Maltby, Chicago, Ill. The invention relates to an improvement in halters, having for its object to construct a halter from a single piece of material, and furthermore to provide for a running noose loop and a hitching or leading strap spring controlled, the spring being attached to the said strap at one of its ends and to the throat latch or equivalent portion of the halter; and, furthermore, to provide a hitching or leading strap having a spring attached at one of its ends to the strap, the strap passing through the spring, and the spring at its opposite end being adapted for attachment to the bridle or bit, whereby the halter strap or hitching or leading strap will not be broken when suddenly pulled upon, since, when the spring has been pulled to its full length and strength the force will be exerted equally upon the entire length of the strap, thus preserving the spring from injury. In fact, when the spring has been pulled out and receives all the strain it will bear, the horse will then be pulling directly on the whole length of the strap and spring combined.

PHOTOGRAPHIC SHUTTER.—Oscar Friese, Berlin, Germany. The invention relates to certain improvements in photographic shutters, adapted to be employed for regulating the exposure of the sensitized film in cameras, and the object of the invention is to provide a device of this character of a simple and inexpensive construction, which shall be adapted to be conveniently manipulated, so as to produce either an instantaneous or time exposure, the construction being such that the shutter may be made of any desired size, so as to give the best results with any lens. The invention consists in a shutter having a series of pivoted parallel strips arranged side by side, and adapted when moved to position at right angles to the sensitized surface to permit free passage of the reflected light between them, but when moved in the reverse direction to fold flat against one another, so as to exclude the light from the lens to which the shutter is applied, and means for actuating said strips simultaneously to open and close the shutter.

INKSTAND.—Rollo M. Badger, Sayre, Pa. This invention relates to certain improvements in inkstands, and particularly in that class of such devices commonly known as "pneumatic" inkstands, wherein the ink is supplied from the ink reservoir to the well or cup proportionately as it is used from such cup or well, and the object of the invention is to provide a device of this character of a simple and inexpensive construction, which shall be adapted to be conveniently adjusted to regulate the supply of ink from the reservoir to the well. The invention consists in an inkstand composed of two parts, the upper part being hollow and forming a reservoir for the ink, the lower part being adapted to rest on a supporting surface and forming a stopper for the neck of the said reservoir, said lower part being provided with an ink well, the upper part being held in an inverted position on the lower part or cup, said sections being provided with passages formed in them and communicating between the ink well and the reservoir, and controlled by the movement of one part relatively to the other.

CHECK STUB HOLDER.—Thomas W. Kimball, New York City. This invention relates to devices for holding the stubs of checks compactly in engagement with the cover of a check book, and the object is to provide a device of simple and comparatively inexpensive construction, which may be quickly and easily attached to a check book, and so constructed that a stub may be easily inserted underneath the holder without disturbing the stubs previously placed underneath the same. The invention comprises a spring tongue adapted for removable engagement with the cover of a check book to engage the stubs turned thereon, and consists of a single piece of resilient metal.

Designs.

DESIGN FOR A MAT FOR PICTURES.—Augusta Wells, Berkeley, Col. The leading feature of the design consists of the border of flowers at the opening in the mat, the edge of the mat at the said opening following the lines of the inner edge of the border of flowers. A minor feature of the design is the said border of flowers appearing in relief.

DESIGN FOR AN UMBRELLA STAND.—Michael J. Collins, New York City. A leading feature of the design resides in the stand comprising the base, the back, the top piece and the vertical spindles between the base and the top piece. Another leading feature is the continuous and pendent spindles between the base and the top piece of the stand.

DESIGN FOR A FRAME FOR BICYCLE SADDLES.—William C. Smith, New York City. In general contour the saddle frame is approximately oval, and its front portion is inclined gradually forward from the ends in direction of the transverse center of the frame, meeting at the latter point what appears as an abbreviated pommel. The bottom of the frame is apparently dish shaped at the cheeks and is of riddled appearance. In the transverse center of the body of the frame is a pear shaped opening, commencing at the cantle portion of the frame and leading to the representation of the pommel, while the marginal surface of the exterior of the body of the frame, the corresponding portion of the pommel projection, together with the margin of the opening, are correspondingly bounded by a border, which border apparently rises from the body of the frame and is intended to represent a flange.

NAPKIN RING.—J. Hasselbring, Brooklyn, N. Y. The leading feature of the design consists in an open work ornament extending transversely of the ring, at the outside thereof, with the ends of the ornament projecting beyond the edges of the ring. Another feature of the design consists in the external annular beads arranged at the edges of the ring and in contact with the middle portion of the ornament to maintain an unbroken continuity of the ring in the rear of the said middle portion of the ornament.

DESIGN FOR A WEEDER.—Rufus J. Lipe, Delta, Colo. The leading feature of the design consists of the zigzag blade, the ends of which range forwardly and terminate in upward side extensions, the bow departing rearwardly from, and disposed at, an inclination to the said upward extensions of the blade and the tang, the lines of which depart rearwardly from the center of the bow.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6889) C. F. T. asks: Has the SCIENTIFIC AMERICAN published any data concerning construction of coils for production of X rays? I desire to make a coil to give 3 or 4 inch spark and would like some information as to best proportions and insulation. A. We have published very exhaustive papers on the subject of X ray work with many illustrations. In SCIENTIFIC AMERICAN, 7, 10, 12, and 14, of vol. 74, also SUPPLEMENT, Nos. 1050, 1054, 1055, 1056, 1057, 1058, 1065, and 1067; price 10 cents each by mail. We do not advise the making by an amateur of so large a coil, as special difficulties are involved in its construction.

(6890) L. F. B. asks: In the last issue of the SCIENTIFIC AMERICAN there was an article on "Improvements in Crookes Tubes." Could you give any information in regard to the size of tube, coil, and amount of electricity required? Do you publish any papers on the Roentgen photography and X rays? Can an armature do anything with this X ray discovery? A. For papers on the Roentgen photography we refer you to our SUPPLEMENT and SCIENTIFIC AMERICAN, as in above query. An ordinary armature is not sufficient to give the requisite potential.

(6891) P. C. T. asks: 1. What are the types of rotary interrupters for induction coils? A. Rotary interrupters are built on the general lines of a commutator. 2. Is Elihu Thomson's air blast for the same purpose as the D. McFarlan Moore method of producing interruptions in a vacuum? If not, what is it for? If so, which is considered best? A. Not exactly. Thomson's air blast simply blows out the arc. Moore's is used to produce a sharp break primarily, but in his work very delicate questions of balance are also involved. His air break is described in the SCIENTIFIC AMERICAN, No. 9, vol. 74. 3. If ordinary induction coil (with core) were excited by alternating current, would the effects be practically the same? A Yes. 4. Should condenser be used? A. Yes. 5. If coil was excited by say a current of 500 volts, would the secondary be of corresponding higher voltage than if excited by two cells of battery? A. Approximately.

(6892) G. H. asks: 1. Is a field efficient for motor or dynamo if polar extremities and yoke are of soft gray iron and waist of laminated iron? A. The laminated waist will, however, have a bad effect in the case of a dynamo in preventing self-excitation. The laminations must be at right angles to the windings. 2. A creeping vine running along and covering the outside walls of a house, have they a tendency toward making these walls damp or do they make damp walls dry? A. This is rather an open question. In summer its effect would doubtless tend to the direction of dampness by excluding sunlight from the wall.

(6893) G. O. B. asks: 1. Can you inform me where I can secure working drawings with description of methods of insulating and construction, size, wire ratio, etc., for a coil to give not less than a 4 to 6 inch spark? Either SCIENTIFIC AMERICAN SUPPLEMENT or some good practical book on the construction and operation of induction coils. I have a current of 4 amperes at 55 volts pressure, with which I want to operate

the coil. A. We cannot refer you to such description, as such large coils are generally beyond the limit of an amateur's work. Our SUPPLEMENT, No. 160, gives a coil adapted to give a 1 to 1½ inch spark. One of twice its linear dimensions, but wound with No. 36 wire, should give a 4 to 6 inch spark. 2. How many turns would be necessary to fully saturate a core 2 inches diameter, 20 inches long, No. 14 soft iron wire, core open, magnetic circuit? A. Owing to the great leakage of lines of force almost any number of ampere turns could be used on the core without completely saturating it. 3. Also what should be the ratio between primary and secondary? I have never had any experience with induction coils, although have had in other lines, and do not just know where to obtain it. A. There is no fixed ratio. We advise you not to attempt to make a coil for 4 inch spark until you have successfully made one such as described in SUPPLEMENT, No. 160 or No. 569.

(6894) J. C. asks: Assuming a green fruit, for instance, a lemon or green apple, can it be converted into a battery? If I pin or confine in a lemon or any green fruit a strip of copper and zinc about half an inch apart, and connect them with a wire, same as in an ordinary battery, electricity will be generated. How can I detect by some visible experiment or proof the presence of electricity? A. Try touching the ends of your wires to a little piece of blotting paper moistened with potassium iodide solution; you may get a brown stain. The wires should be about ⅛ inch apart.

(6895) G. L. H. asks: I am about to make a large induction coil and would like your advice on wire; expect to use No. 36 and wind in thin disks with paraffine. I want to know whether to use double or single covered, cotton or silk. Silk of course is better, but is so expensive. Is it enough better to pay the difference? A. By winding your wire with a lathe you can use bare wire. In our SUPPLEMENT, No. 160, you will find a full description with illustrations of the construction of an induction coil.

THE LIST OF PATENTS.

We regret very much that we are not able to publish in this week's issue the index of inventions for which patents were granted for the week ending June 30. We were not able to procure the list from the government printer at the time of going to press, because the government printing office is in arrearage with its work, due to the fact that the money for the Patent Office work is exhausted. The appropriation for the new fiscal year became available, we are informed, on July 1, and we trust that hereafter we may be able to publish the list without interruption.—Ed.

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THE ORNAMENTAL IRON INDUSTRY.—Description of the method of manufacturing wrought iron into ornamental and artistic forms. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1020**. Price 10 cents. To be had at this office and from all newsdealers.

PROPOSALS.

Proposals for Garbage Crematory

Sealed proposals will be received at the City Clerk's Office, Wilkes-Barre, Pa., until Saturday, July 18th, 1896, at 12 o'clock noon, for furnishing, erecting and completing, ready for operation, a first class crematory for the disposal of garbage. Each proposal to be accompanied by plans, drawings and specifications. Proposals to be endorsed "Proposals for Garbage Crematory" and addressed to Frank Deitrick, City Clerk, Wilkes-Barre, Pa. The right is reserved to reject any and all proposals. FRANK DEITRICK, *City Clerk.*

MANUFACTURE OF STARCH FROM Maize.—By J. Kriegner. Full details of the process. With one illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1012**. Price 10 cents. To be had at this office and from all newsdealers.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 59. Price 10 cents. To be had at this office and from all newsdealers

THE EAST RIVER GAS TUNNEL: Notes on the Construction of.—By W. I. Aims, C.E. Description of the method of constructing the tunnel employed by the East River Gas Company to permit of the extension of its mains into the city of New York. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1022**. Price 10 cents. To be had at this office and from all newsdealers.

RUSTLESS COATINGS FOR IRON AND Steel.—Paints: of what composed, how destroyed, classification as true pigments and inert substances, adulterants, etc.—By M. P. Wood. The essentials of good paint. The characters that a paint should possess for the purpose of protecting structures from decay or corrosion. Natural and artificial asphalt coatings. Iron oxide paints. Zinc and lead oxides. Carbon paints. Inert pigments. A very exhaustive and valuable paper. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1017, 1018** and **1019**. Price 10 cents each. To be had at this office and from all newsdealers.

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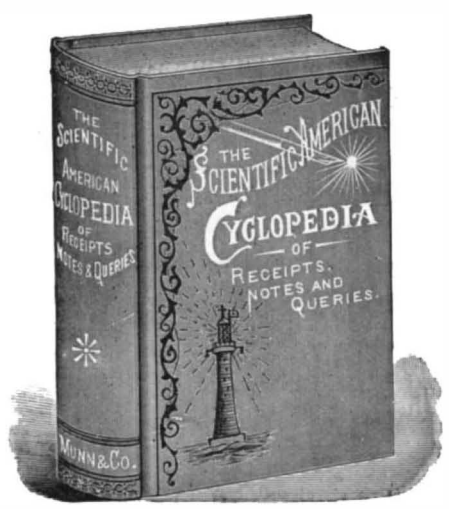

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Typewriter Patent

This company owns Letters Patent No. 558,428, issued April 14, 1896, covering broadly all machines in which the cylinder turns up to expose the line of print, or in which a duplex or cross ribbon feed is used. The patent also covers many other features of modern typewriter construction. Infringers will be vigorously prosecuted.

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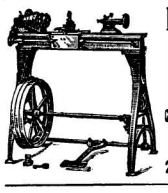

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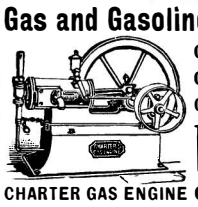

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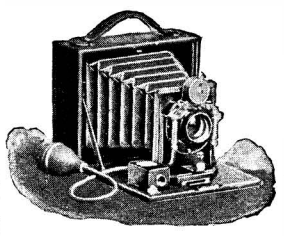

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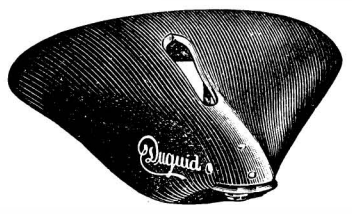

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